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June 1993

MODEL AIRPLANE NEWS

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JUNE 1993 VOLUME 121, NUMBER 6

MODEL AIRPLANE NEWS

FEATURES

ABOVE: *David W. Goerne with his magnificent ¼-scale SIAI Marchetti SF-260. (See construction article on page 66.)*

ON THE COVER: *Proud modeler J.P. Lussier enjoys the beautiful weather, fair winds and aquatic flying machines at the 4th Annual Schneider Cup Re-enactment at Lake Havasu, AZ. This Sachs-Dolmar-powered model of a Curtiss F6C-3 Hawk fighter (converted into a U.S. Cup Racer) is a great piece of work. (Photo by Guy Revel)*

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**, 251 Danbury Rd., Wilton, CT 06897. Second-class postage paid at Wilton, CT, and at additional mailing offices. Subscription rates are: $27.95 for 1 year (foreign, $37.95); $49.95 for 2 years (foreign $69.95). **Postmaster:** send Form 3597 to **Model Airplane News**, P.O. Box 428, Mount Morris, IL 61054.

EDITORIAL

TOM ATWOOD

HISTORY IN THE MAKING

We are pleased this issue to be able to offer you a sneak preview of a new VTOL R/C design developed by a Grumman-led team. The following press release tells the story:

"In late January 1993, a team led by Grumman Aerospace and Electronics successfully flew a vertical takeoff and landing (VTOL), fixed-wing, ducted-fan demonstrator using nothing more than off-the-shelf model airplane hardware. The 20-pound, twin-engine model, powered by two O.S. 91 engines and 6-inch Hurricane fans (modified)

John Gorham, founder of Gorham Associates, an aerospace consulting firm, is the pilot in these photos. Many readers will recognize John as the founder of Gorham Model Products Inc., a former manufacturer of R/C helicopters. He is also a Fellow of the Royal Aeronautical Society and a consultant on the Aerospace Safety Advisory Panel to NASA.

was lifted vertically off the runway by test pilot John Gorham, who then made the first transition into forward flight and back to the hover. Engine rotation was accomplished by rotating the two nacelles through 90 degrees using an Astro 035 electric motor on a 3.5/1 Master Airscrew gearbox.

"The gearbox turned a 10-32 lead screw that pulled or pushed the nacelles through the 90-degree arc. Control of the model during the hover and transition portion was accomplished by a Grumman patented method of using vanes suspended below the nacelles to provide pitch, roll and yaw control. Stability in the pitch and roll axis during hover was accomplished by using Futaba gyros. Conventional aileron and elevator control was used during the horizontal portion of the flight. No aerorudders were used. Early test flights to assess stability and control of the model in the hover mode were done in hangars at NASA Dryden Research Center, Edwards AFB, CA, and at Pt. Magu NAS in Oxnard, CA. All outdoor transition flights were made at the Channel Island Condor's R/C field in Camarillo, CA, with club member John Gorham at the controls.

"Included on the team was the model designer and fabricator, AeroVironment of Simi Valley, CA (builder of the flapping wing teradactyl model), John Gorham (Gorham Associates), who was flight test and controls consultant, Tom Hunt (Grumman pilot and modeler), Bob Kress (Kress Jets, and Grumman consultant) and Martin Burden (Grumman Program Manager).

"Many thanks go out to the officers and club members of the Channel Island Condors for the use of their field on many early morning test flights. Their cooperation was appreciated by all."

An upcoming article by Tom Hunt and John Gorham will appear in these pages, describing some of the previous models built by Grumman for R&D on VTOL aircraft and discussing the developmental history that led to fully "transitionable" fixed-wing model aircraft.

ELECTRICS

Over the last few months, a number of readers have written to request that we start a column on electric flight. As of this issue, we are instituting a column—or perhaps it could better be referred to as a forum—that will be called "Electrics." It is not intended to be an every-issue item, but it is a place where you can expect to find consistently interesting discussion of electric flight from diverse viewpoints. We are pleased to announce that noted electric authorities Mitch Poling and Keith Shaw will head up the column and contribute on a rotating basis. Mitch wrote for *Model Builder* magazine for many years, and if you have taken more than a passing interest in electric flight, you will recognize Keith as one of the most prolific electric scale designers on the U.S. scene. Other notable electric modelers will also be involved from time to time. Look for contributions from Tom Davis, Bob Boucher, Joe Utasi and others.

OOPS!

In Mark Frankel's F4D Skyray construction article in our April '93 issue, we failed to mention two vendors whose products were used in the Skyray. These companies are mentioned in the construction manual that accompanies the plans, but we also want to note here who they are. Scale tires on the F4d were manufactured by Glennis Aircraft Co., 5528 Arboga Rd., Linda, CA 95901; (916) 742-3957. Wing-mounting hardware was manufactured by Byron Originals, P.O. box 279, Ida Grove, IA 51445; (712) 364-3165. ■

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AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

STARSHIP REVISITED

I was impressed with my first issue (February '93) of *Model Airplane News* and was especially touched by the article entitled, "The Murder of a Starship." Having seen several models meet with a similar fate (including one of my own), I can identify with Dan Scherry's exasperation and disappointment at the destruction and theft of his labor of love.

A few words of caution to those readers who were diligent enough to follow the article to its fourth continuation (on page 114). Dan makes the statement "...beware of outsiders and what you tell them, and where you let them go at your field! Until they make a commitment to join, build and fly, keep them at arms' length, and tell them nothing about what your planes, engines, and radios are worth!...."

I ask you to close your eyes and remember when you were an outsider and you asked that guy at the field your first innocent questions: "How fast does it go? How far can you control it? How much does it cost?" Now ask yourself, "If I were held at arms' length and told nothing, would I have made the commitment to the hobby?" Most R/C pilots are so "into" their equipment that they don't have the time or the inclination to promote our hobby. Close your eyes again and think of your first good solo landing. Who was there beside you? Probably the guy who answered those first innocent questions—right?

Establishing and maintaining a suitable R/C flying site is becoming more and more difficult. The two greatest obstacles are noise and safety. The primary source of complaints (legitimate or otherwise) relative to these two issues are from the "outside." If we don't promote our hobby to the interested "outsider," it is destined to shrink, and that's bad for all of us. We have a responsibility to educate the uninformed.

Loved your article about the Starship, Dan and Tom. I wish you had ended it before you threw the baby out with the bath water. Remember when you were an outsider? Good luck on the Phoenix!

MARK K. McCOOL
Oconomowoc, WI

Tom Krasin responds that when it comes to "exotic" stuff, be careful. Dan Scherry, president of the Westlake R/C Club, notes that his club is in contention to be one of the first AMA Gold Star Leader clubs. The club has done much to promote R/C modeling, train newcomers, reduce noise and so on. I agree that all in the sport should welcome newcomers, and Tom and Dan fundamentally agree. So, you may have read a message into their story that wasn't intended. But your caution should be taken to heart by the many modelers who at one time or another may have fallen into the unfortunate category you so well describe. TA

STARSHIP SUGGESTIONS

I think that they built a beautiful model, but after reading the entire story, it would appear that: the field was too small; the engines had not been properly adjusted; the modified Webra mufflers didn't work; as soon as the starboard engine quit, the pilot should have brought the plane down; there was a combined pilot and spotter error that caused the crash into the tallest oak tree. (The tree did *not* "reach up and grab" the plane.)

At best, the spectator's friend that was "supposed to be an absolute monkey when it came to climbing trees" would not have been able to get out on those "smallest branches." A professional tree-trimmer would have cut off the branches holding the model, which would have fallen.

Another mistake was to abandon the model in the tree. For all they know, the wind could have blown it out of the tree.

All of us have crashed planes that we would liked to have flown for years. Sometimes, we have lost everything except the transmitter. It does not feel good, but it's part of the hobby. We do not have to make it worse by sulking and blaming outsiders for our errors in judgement. Tom should have taken his own advice and continued to have a good time solving the problems that confronted them. Maybe they have.

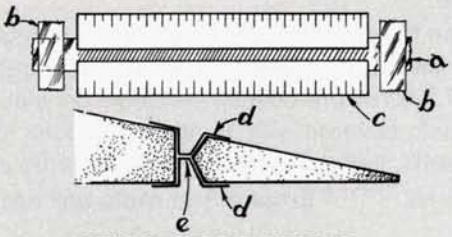
RICHARD HODGE
Coventry, RI

(Continued on page 62)

HINTS & KINKS

JIM NEWMAN

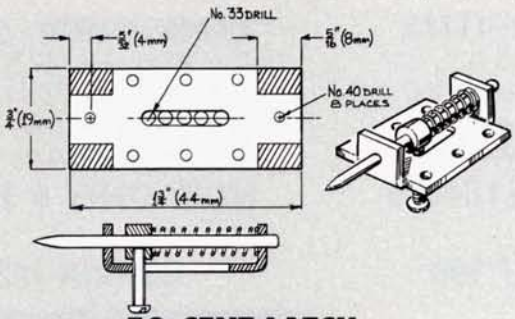
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o *Model Airplane News*, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



HINGE-GAP SEALS

When you cover hinge gaps with tape or covering film, the hinges are often stiff or squeaky. To cure this, just remove a strip of the adhesive tape or covering, as shown. Lay a strip of tape (a) sticky side up on the bench and secure it with tape (b). Lay two straightedges (c) on the tape, leaving a 3/16-inch (5mm) gap between them. Use thinner to remove the adhesive between the straightedges, and then use a second strip of tape to seal the gaps as usual (d). Since there's no adhesive to stick the tapes together at (e), the hinge will operate smoothly. (The control gap in the diagram is exaggerated for clarity.)

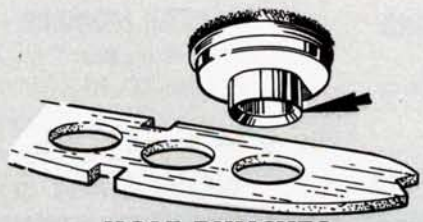
Andre Bruens, Ede, Holland



50-CENT LATCH

You'll need a 3/4x1 3/4-inch piece of 1/16-inch (1.5mm) aluminum, a 3/32-inch (2mm) wire pin, a matching wheel collar and a no. 20 spring from a hardware store. Cut out the shaded areas with a saw, drill holes where shown and bend up the two end tabs. Use epoxy or screws to mount the latch on the hatch or canopy. You could also use a piece of U-shaped channel aluminum to avoid having to bend the sheet aluminum.

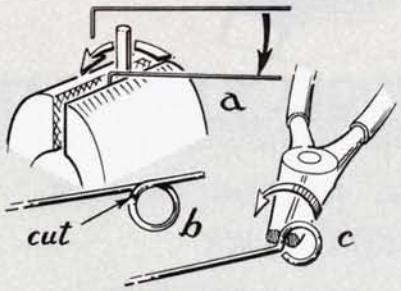
Bob Branch, Houston, TX



HOLE PUNCHES

Pound-in feet for chair legs make useful, inexpensive hole punches. Glitsa-brand feet work perfectly for this and are available in three sizes, ranging from 3/16 inch (5mm) diameter to 3/8 inch (9mm) diameter. The feet also have a felt pad on the bottom, so they're easy to turn with your thumb.

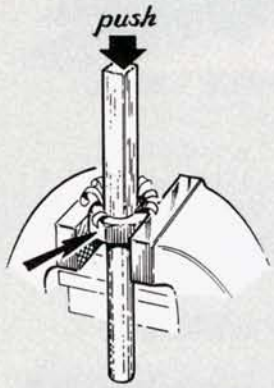
Lee Hulteng, Grand Forks, ND



PERFECT WIRE LOOPS

Clamp a rod or a nail in a vise. Make a 90-degree bend in a piece of wire and secure one end in the vise. Pull the wire around the rod or nail, as shown (a). Snip off the excess wire as shown in (b), and then bend the loop back 90 degrees as in (c).

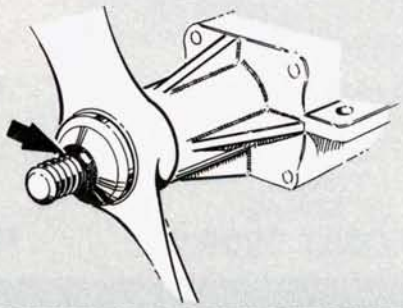
Dave Gierke, Lancaster, NY



BALSA DOWELS

Clamp a nut of a suitable size in a bench vise, and then firmly push or tap a balsa stick through the nut to form a round dowel.

Bob Robert, Durrington, Wiltshire, England



PROPELLER SAFETY RETAINER

When an engine backfires, it often throws off the propeller, washer and nut. To prevent this, before you install the washer, force a tightly fitting rubber O-ring onto the shaft, as shown. The O-ring will prevent the nut, washer and propeller from spinning off.

Charles Bower, Litchfield, CT

AEROBATICS MADE EASY

DAVE PATRICK

PROPPING FOR POWER!

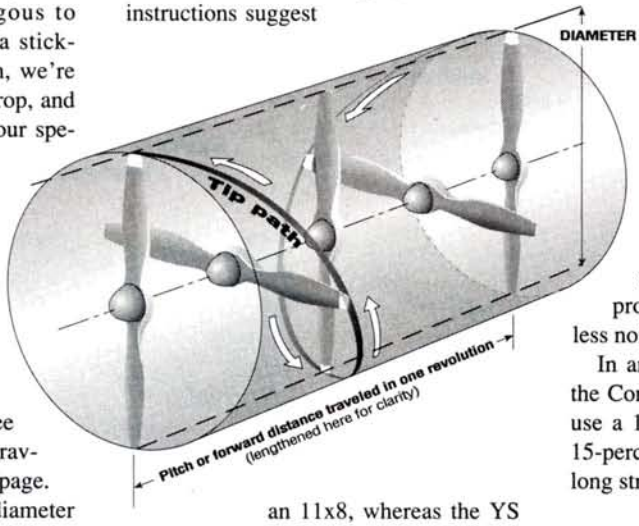
YOU WOULD be amazed at how important it is to select the proper propeller for your aerobatic airplane. Like the selection of your plane or engine, it has a major impact on aerobatic performance. It's somewhat analogous to selecting the optimum gear in a stick-shift automobile. So, this month, we're going to cover how to select a prop, and how to tailor that selection to your specific needs.

For those who haven't taken a close look at propellers, this is probably a good time to explain what the numbers on props mean—e.g., a 12x9 prop has a 12-inch diameter and a 9-inch pitch. Pitch is the theoretical distance the prop would travel in one revolution (see Figure 1). In real life, the props travels somewhat less because of slippage.

In the simplest terms, more diameter provides more thrust, and more pitch provides more speed. This sounds great, but unfortunately, you usually can't have both. For example, if you increase diameter without reducing pitch, you will end up with too much prop for the engine. The engine will turn at less than its optimum rpm. This results in the engine delivering less power, and possibly overheating (or even becoming damaged). The same thing can happen if you increase pitch without reducing the diameter.

LET'S TRY IT ON FOR SIZE

Let's look at a .60-size engine for our working example. The first step is to look into which props the manufacturer recommends. For example, the YS .60 instructions suggest an 11x8, whereas the YS .61 long stroke is said to be happy with a 12x9. These will work great as they allow the respective engines to operate at the optimum rpm for the particular engine design. But let's say your aircraft is large for a 60—possibly a Goldberg Ultimate (which flies great on a 60!). Here, you will want a prop that has a lot of thrust, which means you'll need to select a larger diameter.



If you're using the YS long stroke, the next size up in diameter from the 12x9 is 13 inches. But remember? We have to go down in pitch. You can use a rough but simple formula as a guideline to determine what the prop size should be. First, multiply the diameter times the pitch, i.e., 12x9=108. I call this number the Prop Loading Factor (PLF). Now, divide the PLF by the diameter that you want to use—in this case, 13; i.e., 108÷13=8.3. Round it off to the nearest available prop size, and the answer is 13x8. Simple!

There are many other factors to consider. For example, the amount of nitro. Generally, the more nitro in your fuel, the more power. But engines being fed a diet of higher nitro like to operate at a higher rpm. If you use a tuned pipe, you will also get more power, which will allow you to use a higher PLF. Noise can be another factor in choosing a prop—lower rpm/tip speed delivers less noise.

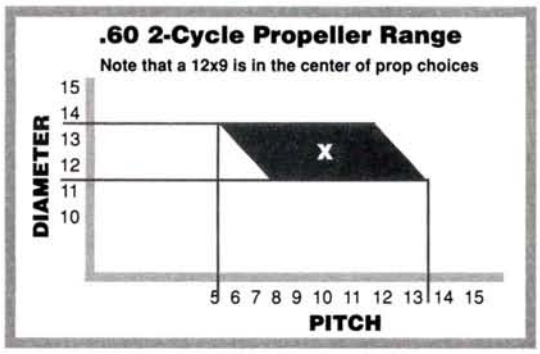
In an average-size pattern ship (e.g., the Conquest 7) that needs to be quiet, I use a 12.5x11. It works very well with 15-percent nitro fuel on a piped YS .61 long stroke.

FLIGHT TESTING

Now that we're more expert in propeller selection, we will turn our attention to test flying, which is the real test. Bring a range of props to the field, and wring them out. Get a feel for how a given propeller size feels in the air, then quickly try another. You'll soon learn which prop works best for you.

When trying out different prop sizes, you should stay with a particular brand (you don't want subtle differences between brands to throw a wild card into your testing procedure). Determine what works best for you, and then do the same experiment with a different brand.

At the risk of sounding like a commercial, I am now using the APC line of props almost exclusively. But there are other fine products available (which I also use), and I don't claim to have thoroughly tested every relevant size of every brand out there—don't be afraid to experiment! Till next time. ■



AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

CECIL B. DEPHOENIX

Do you remember the "R/C Airborne Video" by R/C Aerial Makers & Model Manufacturers that was reviewed by Jeff Raskin in the November issue of *Model Airplane News?* Well, this is a scaled-up version of one of the camera-carrying models seen in that video. The Phoenix II has a span of 14 feet, weighs 47 pounds and can handle a 15-pound, 35mm camera and 200 feet of film. Contact R/C Aerial Film Makers & Model Manufacturers, A.R. & H. Kingsford, 12 Toru St., Mapua, Nelson, New Zealand; (03) 540-2577; fax (03) 547-3498.

ISLAND HOPPING ISLANDER

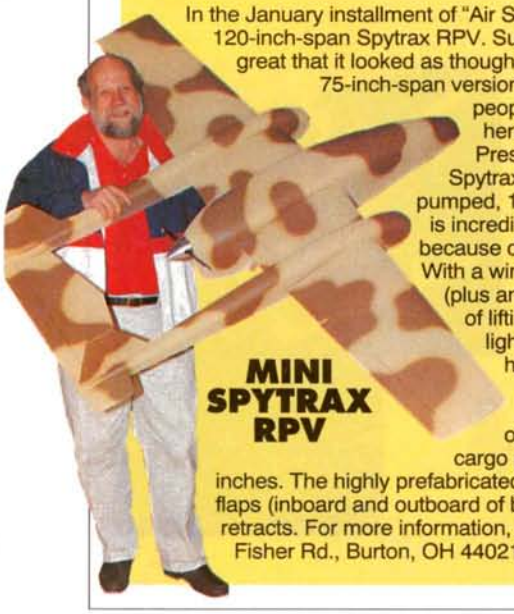
The Westvlaamse Aero Club of Belgium has successfully piloted this 14-foot-span Britten Norman Islander model, powered by two G38s, across the English Channel from Dover, England, to Ostend, Belgium—approximately 120km. Traveling at 52 knots at an altitude of 500 feet, the model completed the flight in 1 hour, 8 minutes. According to *MAN* reporter Lucas De Weerdt, "There exists a plan to fly from Manston to Middelherke *[also 120km]* and back, because the fuel tanks were still more than half-filled at the end of this flight." For more information on this historic R/C flight, contact Westvlaamse Aero Club, Delannoy R 28, Diagorasstr 8510, Marke, Belgium.

TORQUEMASTER

Mick Reeves' Torquemaster speed-reduction drives for the Zenoah G62 and G 23 are now available from Bob Holman. These bolt-on units, which require no engine modification, move the thrust line closer to the center of the engine to make in-cowl installation easier. The reduction ratios—1.75:1 or 2:1 for the G62, and 2:1 for the G23—increase torque by driving bigger, more efficient props. According to Bob, the G62 unit swings a 28x15 prop at 4,400rpm and can pull a 30-pound ⅓-scale Camel straight up. Contact Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402; (909) 885-3959.

THE PERSUADER

This belt-reduction assembly from Miller R/C Products is designed to start those big-block engines—even when it's cold. Operating at 1,400 to 1,800rpm, the 4:1 belt-reduction ratio gives you four times more torque, and the system is easy to mount on your starter. The unit comes with an insert starter cone for spinners, and a Big Tuff Grip insert is available for prop nuts. The belt reduction fits most high-quality 12- to 24V starters. For more information, contact Nancy Miller at Miller R/C Products, P.O. Box 425, Kenwood, CA 95452 (707); 833-5905.



MINI SPYTRAX RPV

In the January installment of "Air Scoop," I unveiled L&R Aircraft's 120-inch-span Spytrax RPV. Subsequent interest in it was so great that it looked as though the introduction of this smaller, 75-inch-span version might be delayed. But the people at L&R persevered, and here in the hands of L&R President, Rob Roy—is the Mini Spytrax. Designed specifically for pumped, 1.20, 4-stroke engines, the Mini is incredibly light (8.5 pounds, dry) because of its high-tech construction. With a wing area of 853 square inches (plus an additional 213 square inches of lifting area), the model has very light loading, hence superior handling. The Mini is designed to handle a 7-pound payload, and even more with its optional 81-inch span. The cargo pod measures 32x5.5x4.5 inches. The highly prefabricated Mini Spytrax incorporates split flaps (inboard and outboard of booms) and uses Robart retracts. For more information, contact L&R Aircraft, 13645 Fisher Rd., Burton, OH 44021; (216) 834-1578.

A DIESEL SHAKE

Some modelers avoid powering their airplanes with diesels because they don't like the smell of the exhaust. Eric Clutton has the solution! Despite its name, Olde English Mix is a brand-new diesel fuel with a vanilla-like aroma! Engine performance is said to be unaffected. It costs $8 per quart. Do not try flavoring your milk shake with Olde English please! Contact Eric Clutton, 913 Cedar Ln., Tullahoma, TN 37388.

AIR SCOOP

HONORARY INDUCTEES

At this year's Nürnberg Toy & Hobby Show, yours truly and my 6-foot, 6-inch cohort—Midwest Products' president Frank Garcher—became the first Americans inducted into the Secret Order of the Knights of Nürnberg; it's kind of like a Bavarian Raccoon Club that dates back more than one hundred years. Note the medals around our necks. Of course, Herr Garcher ist der Bürgermeister of the American chapter; he has yet to decide my position. Next year, we'll receive our official hats; believe me, they're real doozies. The following pictures are some of the highlights of the show.

GRAUPNER SU 26 M

Graupner's new 59-inch-wingspan Sukhoi features quick and light balsa construction. The SU 26 can be powered with a .40 to .46 2-stroke engine, a .60 to .80 4-stroke engine or an Ultra Series electric motor with belt-reduction drive. Instructions depicting both propulsion modes are included. We will be doing an in-depth review of this one in the near future. Hobby Lobby International will be setting a release date shortly.

COMFORT CONTROL

Here's a sneak peek at Panda's new single-stick Elite 3-channel system. The third throttle channel is activated by a slide switch on the side of the transmitter. Note the high degree of contouring on both the front and back of the transmitter box. I can tell you firsthand: it's very comfortable. There's no word yet on its availability in the U.S.

R/C TRAINING KITE

With their Lilienthal prototype, has Bauer Modelle come up with a better way to train beginners? The all-balsa, 69-inch-wingspan R/C kite acclimates the trainee while it's still connected to the string. Then, when the instructor feels the "fledgling" is ready, he kicks the student out of the nest by remotely disconnecting the string from the Lilienthal; the student is then on his own. Fortunately, the Lilienthal is extremely docile. I'll keep you updated with news on this prototype and possible production dates, but don't look for it anytime soon.

SILENT STOW-AWAY

Pictured here with die schöne Fräulein Roth is the new Graupner Ventus-travel 4000 4-meter sailplane. It features an ingenius, retractable, fold-and-hide-away belt-drive prop. When the unit is fully retracted, two hatch doors seal the bay. The Ventus also features a retractable belly wheel with bay doors. Availability will be announced by Hobby Lobby International.

AIR SCOOP

TSURGI (Sword of the Samurai)

Owing to extensive R&D at Hirobo, their new 60-size performance machine—the Tsurgi—is brought to the market at a great, reduced price, compared with earlier competition-level choppers. The Tsurgi stresses simplicity, and it has a new, durable, close-tolerance seesaw rotor head that gives quick response for precise aerobatics. For more information, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818; (908) 248-0400.

FAMILIAR NAMES OF MODELING

The Nürnberg Toy & Hobby Fair wouldn't be the same without the presence of these two happy faces: Johannes Graupner and the vivacious Andrea Kavan, whose names are known and respected by modelers around the world.

BEGINNING SUCCESS

Also new from Robbe is this electric-powered Delta wing—the Skyflex. This prefabricated model can't be stalled, and it's self-righting from any flight altitude, so it's perfect for the individual who has no R/C experience. A servo that moves the aluminum cross-beam changes the wing's form so that turns can be performed. Switching the motor on and off controls altitude. A 7-cell battery gives approximately a 6- to 7-minute flight. A 2-channel radio is required. For more information, contact Robbe Model Sports, 170 Township Line Rd., Belle Mead, NJ; (908) 359-2115.

ROBBE MOSKITO

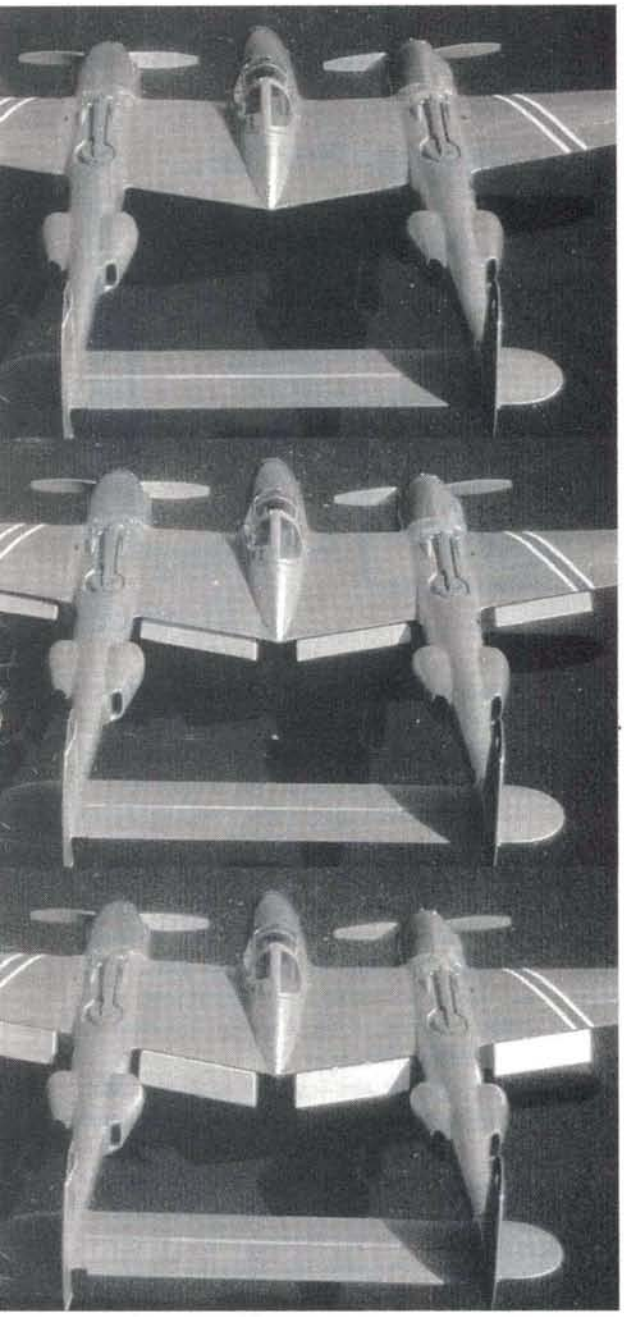
Robbe's completely new, reasonably priced .40 Moskito is designed to be docile enough for beginners, and it can be easily transformed into an aerobatic performer. So that newcomers can begin with any 4-channel radio, the model can be fitted with a mechanical throttle/collective pitch mixing using one servo. Electronic collective and throttle mixing can, of course, be added later. The kit comes with both wheels and landing skids and a canopy that can be used if the exposed figure is not to your liking.

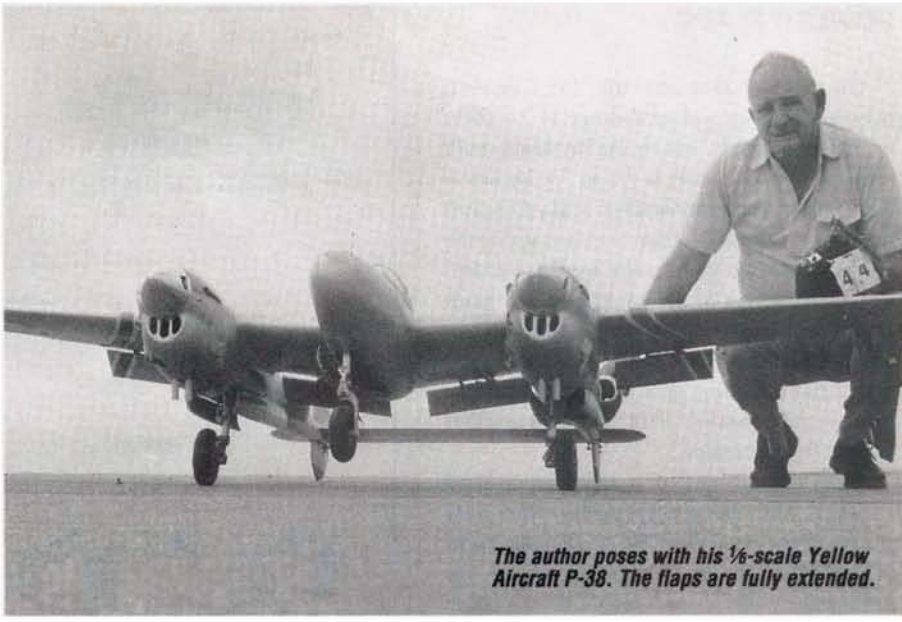
NSU/WANKEL

This new NSU/Wankel debuted at the Graupner Booth this year. Swinging 18- to 20-inch props within the 2,500 to 11,000rpm range, the 4-pound, 5-inch-diameter Wankel, designed for large-scale models, is reported to produce more than 4hp. This smoothly running beauty will be available from Hobby Lobby late this fall.

THUNDER TIGER DECATHLON ARF

The lovely Mrs. Lai—the wife of Thunder Tiger's President Aling Lai—is holding the new 64-inch-wingspan Decathlon from Thunder Tiger. This ARF features balsa, lite-ply and spruce construction. The balsa-sheeted, foam-core wings have open bays routed into them to keep things light. The model is finished with an iron-on covering in the red-and-white scheme shown here. It's coming soon.





The author poses with his 1/6-scale Yellow Aircraft P-38. The flaps are fully extended.

Add a New Dimension to Your

FOWLER FLAPS

Deploy half and full flaps

by ROBERT M. ALMES

The pictures above show my 1/6-scale Yellow Aircraft P-38 with Fowler flaps retracted, set at a half-flap position and fully extended.

THE JULY '92 ISSUE of *Model Airplane News* contained photos, plans and construction notes on building Fowler flaps. At that time, I limited the operation of the flaps to either full-up or full-down. Full-size aircraft that employ Fowler flaps have three flap configurations; besides full-up and full-down, there's an intermediate half-flap position—often referred to as a maneuvering flap. A three-position flap requires the use of a three-position control valve. Such a device wasn't then available; in fact, the precision required for its manufacture is beyond the capabilities of most model builders.

When servos are used to power them, the heavy-duty function of flaps can cause a serious power drain on radio flight packs. I expected that the advent of an appropriate control device would increase the use of air cylinders to power flaps in all types of scale aircraft. With this view in mind, I submitted to several manufacturers a drawing that illustrated the principle of a three-position control valve. The response was encouraging, and in one instance, a prototype was submitted for ground and flight testing. With minor modifications, CBA Models* produced an excellent valve that retails for $16.95 (part no. AV-3FV). The company went one step further and designed a twin-spool air valve that provides control for three-position flaps and retractable landing gear (part no. AV-3F/R).

At this juncture, one might ask what significant advantage there is in a three-position flap compared with a two-position flap. For its time, the P-38 had the highest wing loading of any aircraft in the world—fighter or bomber. Lockheed designer Clarence "Kelly" Johnson equated high wing loading with excellent penetration characteristics. The downside is a fast no-flap approach and landing speed. However, Fowler flaps provide a dual function: at half flaps, the wing area is increased by 6.38 percent, and at full flaps, by 12.75 percent. Like any other high-performance aircraft, the P-38 has a maximum flap-deployment air speed. Deployment of flaps at high air speeds can result in structural damage and excessive pitch-up. When slowed to flap speed, the maneuvering flaps allow a smooth transition through landing-gear extension and full-flap configuration, with minimal pitch-up and little or no trim change.

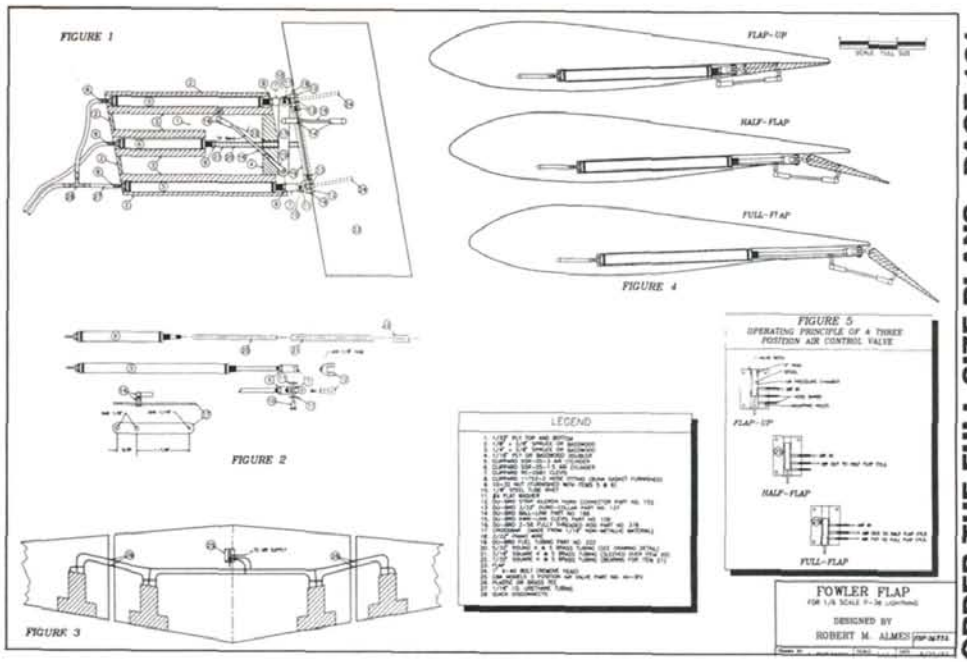
FOWLER FLAPS

On the full-size aircraft, the CG shift between gear-up and gear-down is 7.4 inches. On my models, which use my home-built retracts, the CG shift is 1/2 to 5/8 inches—well within the comparative scale-CG-shift factors. At the half-flap configuration, the CG shift change that results from the extension or retraction of the landing gear is hardly noticeable. Any nose-heavy effect disappears when full flaps are deployed. Proper use of flaps, landing gear and throttle simplifies aircraft control. (But that is a another subject for discussion.)

With the advent of a suitable control valve, I am obliged to update the July plans—for a 1/5-scale CBA P-38 with built-in provisions for my Fowler flap units—for those who wish to incorporate the half-flap feature. No modifications are required to employ either the two-position or the three-position flap unit. Examination of the principle involved will make it clear that the three-position add-on feature to these plans is fairly simple.

I've installed Fowler flaps in a 1/6-scale P-38 by Yellow Aircraft*. I've also reviewed the plans for Columbia Model Works'* version of the plane, and I've concluded that Fowler flaps are readily adaptable to that kit, too. In both instances, some adjustments must be made to accommodate the flap units; therefore, prudent consideration of one's abilities are in order.

This second treatment of Fowler flaps offers an excellent opportunity to present the concept on a different scale from the one used in the July issue. This dual treatment should provide enough information to adapt the Fowler flap concept to any scale aircraft.



ORDER THE FULL-SIZE PLANS...PAGE 121

CONSTRUCTION

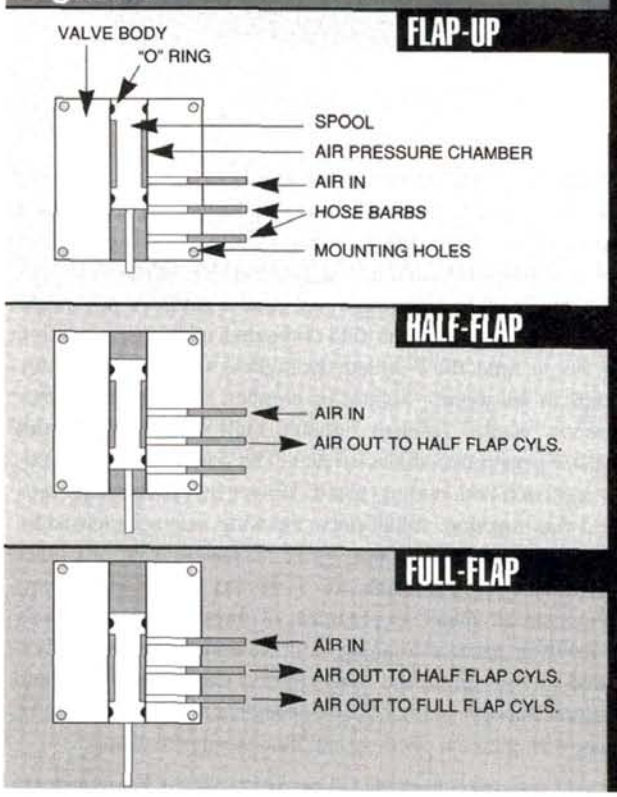
The construction notes in the July issue also apply here. Since the three-position flap function is merely an added feature to the original plans, discussion herein will be limited to that portion. A three-position flap requires that a third cylinder be added to the unit. On the 1/5-scale units, a Clippard* SSR-05-2 is used. This cylinder has a piston thrust length of 2 inches, and when it's fully extended, it will satisfy the half-flap function. On the 1/6-scale plans shown herein, a Clippard SSR-05-1.5 cylinder is used. This cylinder has a piston thrust length of 1.5 inches and will also satisfy the half-flap function when fully extended.

Slide a piece of fuel hose over the flap hinge. The two Du-Bro* Dura-collars shown at each end of the hose are designed to retain the hinge in its proper place with the use of setscrews. The intent here is to allow removal of the flap for finishing or for other maintenance.

Except for the lengths of brass tube involved, the half-flap assembly is the same for both scale plans. Attach a Clippard hose fitting to the end of the air cylinder. Be sure to use the Buna gasket provided. Prepare the lengths of brass tube as shown on the plans. The 5/32-inch round tube and the 3/16-inch square tube are intended to extend the length of the cylinder piston to engage the rubber bumper on the flap hinge. The 5/32-inch square tube and the short piece of 7/32-inch square tube are intended to prevent the piston shaft from turning. The short piece of 7/32-inch square tube also serves as a guide and bearing for the assembly.

Apply a drop of Loctite* 271 thread-locking compound—available at auto parts stores and hardware stores—to the threads of the air-cylinder piston. Slide the 5/32-inch round tube over the threads, but be careful not to get Loctite in the cylinder barrel.

Figure 1

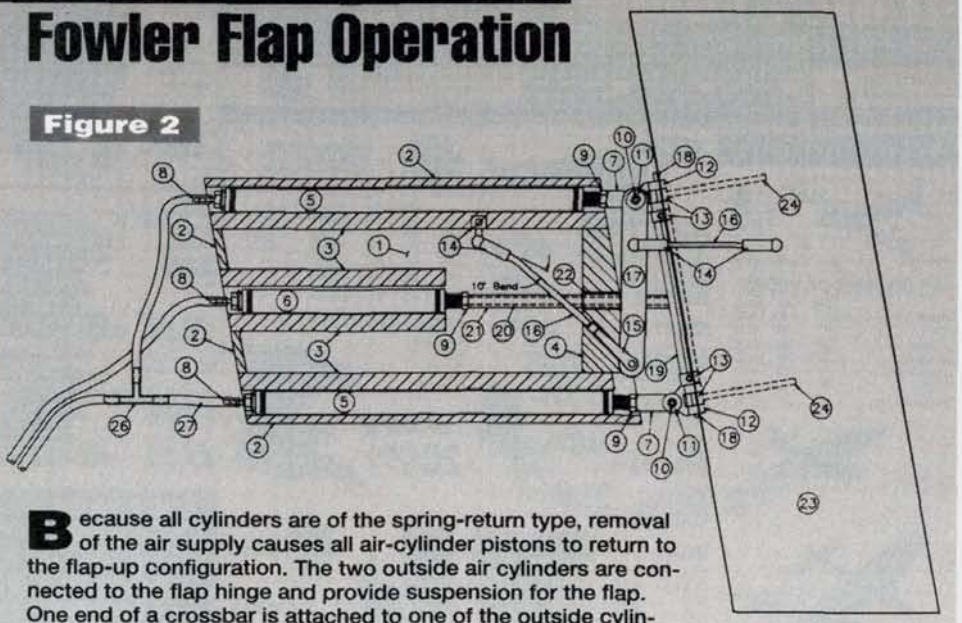


Air-Control Valves

Most air-control valves are of the two-position variety to operate retractable landing gear. They contain a spool device that creates an air chamber within the valve body. The spool shuttles the input air source from the central port to one or more operating ports on either side of the valve body. The central air port always shares the air chamber with an operating port. The three-position air valve also contains a spool device that creates an air chamber within the valve body. However, in this case the spool can isolate the air from the operating ports. In addition, the spool is capable of spanning two or all three of the air ports. In the flap-up mode, the air-supply port is isolated from the half-flap and the full-flap ports. In this air-valve mode, the flap cylinder return springs maintain a flap-up configuration. When the half-flap mode is selected, the spool spans the air-supply port and the half-flap port, creating a maneuvering flap configuration. A full-flap selection causes the spool to span all three ports, and a full-flap configuration results. When the spool removes air supply from one or both operating ports, the appropriate air cylinders retract their respective pistons. Any flap position is available upon command, regardless of the flap position when the command is initiated.

Fowler Flap Operation

Figure 2



Because all cylinders are of the spring-return type, removal of the air supply causes all air-cylinder pistons to return to the flap-up configuration. The two outside air cylinders are connected to the flap hinge and provide suspension for the flap. One end of a crossbar is attached to one of the outside cylinders. The other end is connected—by way of a Kwik Link—to a restraining rod that extends diagonally across the frame and is anchored to a ball socket. A flap-drag link connects the crossbar to the flap, aft of the flap-hinge line. The center cylinder employs a brass tube extension assembly that butts up against the flap hinge. A length of fuel hose acts as a bumper between the brass tube and the hinge. When a half-flap selection has been made, air extends the center air-cylinder piston a distance of 1.5 inches (2 inches on the 1/5-scale unit). This action overcomes the retract-spring tension on the two outer cylinder pistons and causes them to extend the same distance as the center cylinder piston. The crossbar and restraining rod are extended, changing the angle of the crossbar. Since the flap-drag link is somewhat restricted in its travel, the flap rotates downward across the flap-hinge line. The flap has been extended halfway aft and progressively angled downward 20 degrees; thus, a half-flap configuration is achieved.

When a full-flap selection has been made, air extends the two outer cylinder pistons their remaining length. The flap-hinge line has moved away from contact with the center cylinder piston assembly. The crossbar has been extended further aft, causing additional extension of the crossbar and the restraining rod. The resulting change in the crossbar angle causes the flap-drag link to rotate the flap downward to a full 40-degree angle; thus, a full-flap configuration is achieved. If a half-flap selection is then made, the flap hinge will return to the extended center cylinder piston assembly—which is still in the half-flap configuration. Any flap position is available upon command, regardless of the flap position when the command is initiated.

Using a pair of diagonal pliers or an electrical-terminal crimping tool, crimp the tube at a couple of places where it fits over the threads of the piston. Add a few drops of Loctite to those spots. Also, apply a few drops to the half of the round tube that's farthest from the cylinder. Slide the 3/16-inch square tube over the round tube. This should provide a strong bonding of parts.

File a half-round slot at approximately a 10-degree angle at the end of the brass extension tube to provide a neat fit against the rubber bumper. Draw a center line on the ply floor to help align final assembly. Laminate a piece of 1/16-inch-thick plywood or basswood at the front edge of the ply floor (shown as item 4 on the plans). This piece acts as a floor for the 7/32-inch brass bearing. Slide the brass bearing over the square piston extension assembly, and lay the whole assembly along the center line of the unit. The end of the brass extension should butt up against the rubber bumper of the flap hinge. Make sure that the air-vent hole is facing upward and that the cylinder is properly aligned. Fasten the spruce rails in place with CA. The brass bearing should then be secured as it freely rests on the ply floor. Don't try to force an alignment, and be careful not to get CA inside the bearing. Check the unit for proper operation. When you're satisfied that all is well, the unit is ready for attachment to the flap and installation in the aircraft.

**Here are the addresses of the companies mentioned in this article:*

***CBA Models**, 1620 N. Leavitt Rd. NW, Warren, OH 44485.*

***Yellow Aircraft**, 203 Massachusetts Ave., Lexington, MA 02173.*

***Columbia Model Works,** 3411 Sherwood Dr., Columbia, MO 65202.*

***Clippard Instruments Laboratory**, 7390 Colerain Rd., Cincinnati, OH 45239.*

***Du-Bro Products**, 480 Bonner Rd., Wauconda, IL 60084.*

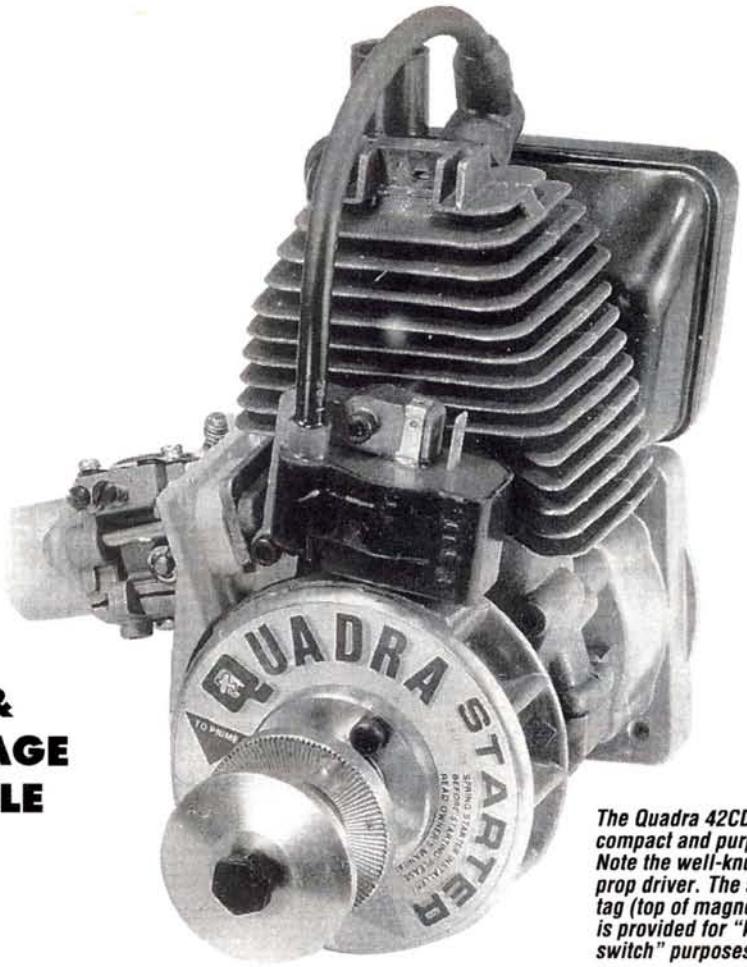
***Loctite Corp.**, 4450 Cranwood Ct., Cleveland, OH 44128.*

by MIKE BILLINTON

ENGINE REVIEW

AEROW QUADRA 42 CD

A PRACTICAL & COMPLETE PACKAGE FOR LARGE-SCALE MODELERS



PHOTOS BY MIKE BILLINTON

The Quadra 42CD is compact and purposeful. Note the well-knurled prop driver. The solder tag (top of magneto coil) is provided for "kill-switch" purposes.

THE NAME IS significant to aeromodelers because the gas-burning, Quadra 35cc, spark-ignition, chain-saw, 2-stroke engine of the late '70s launched the ¼-scale movement and facilitated the flight of many increasingly impressive large-scale models.

The engine's low rpm and high torque were exactly what the "large propeller/realistic sound" enthusiasts needed, and it generated some useful competition among traditional model-engine manufacturers. The O.S. 35cc, the Super Tigre 45cc, the 60cc in-line twin, and the OPS 30cc and 60cc flat twin are a few of the other specialist engines that were introduced for the new large models. (Their manufacturers weren't prepared to risk conceding ground to the modified industrial engine.)

Some modelers still appreciate having a choice between industrial engines and "model" engines. The former run on gas, which is readily available, and offer simple, magneto, spark ignition and long plug life; the latter offer cooler running (on methanol fuel) and a lightweight, glow-plug ignition. The high-quality construction and finish of model engines appeal to those who don't appreciate the less refined—even brutal—look of the industrial engines.

RELIABILITY—INDUSTRIAL STYLE

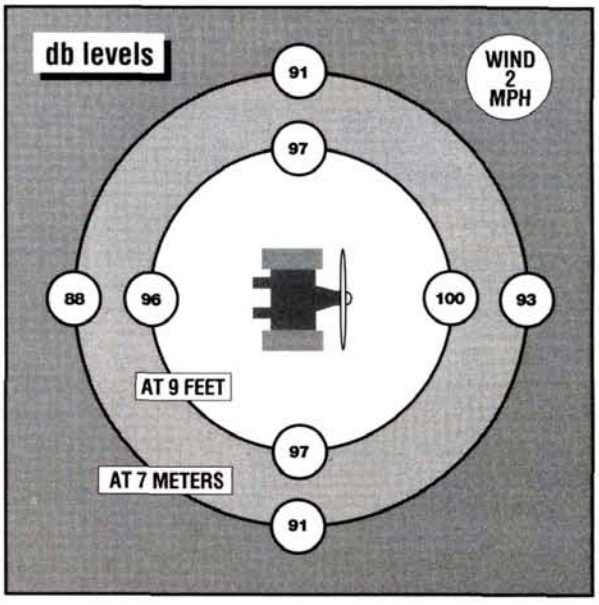
For reliability, the industrial engines lead the way; they can withstand careless use. In exchange for the higher power levels they provide, model engines need more care and consideration.

Industrial engines are tougher because they invariably have rolling-element crankshaft bearings and the same type of bearings at both ends of the steel connecting rod, and a piston ring and chromed cylinder bore are standard. They also offer an almost tamper-proof diaphragm pump carburetor (which doesn't care where the fuel tank is) and a foolproof ready-to-go magneto ignition system.

I tested the earlier Quadra 35, so I welcomed the chance to test this upgraded version and to compare the two.

CRANKSHAFT COMPROMISES

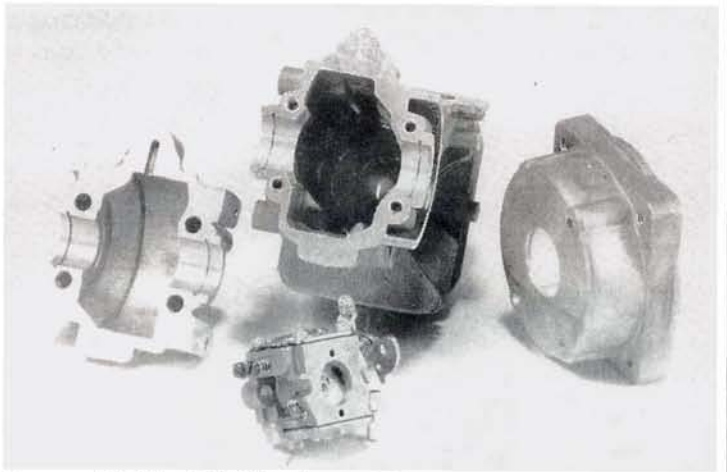
The new engine still has the unusual—but reliable—Quadra crank assembly, and it shows the usual internal-combustion-engine compromises: its sub-piston induction layout with "petroil" lubrication was designed to have as few parts as possible and to require minimum mainte-



nance for a long life.

Ideally, the big end would have roller bearings *and* a one-piece eye. The crank needs twin main shafts (at one end, the power train, and at the other, the starter mechanism), and it should be one piece. This dictates rod assembly: you have to remove material (quite a lot) from one of the crank webs, then ensure that the rod eye's diameter is large enough to fit onto the main shaft, the residual crank web and the crankpin. This method obviates the need for a more complicated arrangement, i.e., separate webs and pressed-in crankpins.

This simpler method is still used on the Quadra, and it results in a particularly reliable big-end assembly—it has 11, 0.15-inch-diameter rollers and a large-diameter (0.718 inch) eye—in a hardened-steel shank. All this means that the main crank must be balanced by one web, and this web has to be fairly large and offset more than usual from the piston center line. Finally, to balance the large crank web, the magneto flywheel has to be more balanced.



Foreground: Walbro "block" carburetor; it's easy to operate, even though its construction is complicated. Left: crankshaft's bottom-end support. Center: main cylinder block.

MODELING MODIFICATIONS

These essential modifications have been made for Aerrow's Canadian distributors by Klaus Nowak:

- To reduce weight, the flywheel cooling vanes have been removed. (In its cowled form, the engine required the forced draft that came from those vanes.)
- To cope with large, high-inertia propellers, the front end of the crank has additional bearings and a housing.
- The engine has a custom-made propeller driver.
- The rear radial mounting has been specially cast.
- Like Cox engines, this Quadra has a rear spring starter and uses a one-way roller clutch bearing.

The helicopter version of this engine has forced cooling and a pull-starter. For aircraft and boat use, there's a 30-ounce, 20-inch-long (when doubled over) tuned pipe by Cosmocon; it obviously increases weight, but it offers approximately 25 percent more power in exchange. Unfortunately, a pipe wasn't available for this test, so I couldn't check it. With its standard muffler, however, the engine can handle a 22-pound model (all-up weight) and an 18x12 prop.

There's also a glow-plug conversion kit; it has a larger, "jetted" carburetor for the necessary methanol fuel. Gas and methanol are OK for spark-ignition engines, but glow plugs need methanol if they're to operate satisfactorily. You can run glow-ignition engines on gas, but you'll notice definite starting difficulties, and the fuel-mixture range that gives good performance will be way too narrow.

Top left: recoil-starter spring and one-way clutch bearing. The connecting rod is made of machined plate, and the hardened eye surfaces have loose rollers at both the little and big ends. Note the large crank-web balance weight; it allows the use of a one-piece crank. Top right: the 42CD's extra, front, main roller bearing in a turned housing.

DIMENSION DIFFERENCES

The major differences in dimensions between this 42cc and the earlier 35cc version are:

- Bore is now 40mm (up from 36mm).
- The stroke/bore ratio is now well over-square (0.825:1 compared with 0.900:1).
- The compression ratio has been increased by 1 unit to 9.5:1.
- The potentially troublesome contact-breaker points of the earlier model have been replaced with the simpler, capacitor-discharge ignition system.

Port timings and the sizes of other mechanical parts are virtually the same. The simple, bifurcated, Schnuerle porting (without a third boost port) has been retained, as has the totally reliable sub-piston induction. Most of this compact engine is inside the cylinder casting—built-in head, transfer passages, bore with plated surface, crankshaft and magneto supports.

PERFORMANCE

When running-in this engine, the main consideration is the piston/ring/plated-liner assembly. The crank and rod roller bearings are of much less concern.

In the spring of '91, a new, "Nicasil"-coated, cast-aluminum cylinder block was produced by Mahle. Over time, when used with a hard-wearing ferrous ring, the cylinder's compression seal gradually improves. In my three-hour test, the seal remained virtually unchanged. Reports suggest that, unlike the plain-piston ABC engines that we all know, this engine's performance improves with time.

I tested the 42CD with a range of large props, and it coped better than the earlier 35cc engine—so it should, with its 20-percent-greater capacity.

The engine's rpm ranged from 4,653 to 7,975 (its manufacturer recommends that static rpm should be around 6,500/7,200). Aerrow also claims that maximum horsepower occurs at 9,500rpm, so I surmise that to reach the claimed maximum, you'd have to use a fairly small prop. (At higher rpm, you'd also get loads of noise and long takeoffs.) Dyno tests showed that at rpm above 8,250 or so, there was increasing vibration, and I didn't want to force the issue.

Test 1. Open exhaust. Fuel—regular (unleaded) gas with 4 percent Esso 2-stroke mineral oil (as recommended by the manufacturer).

If you run the engine on methanol, you're advised to use 15 percent oil—a delightful continuance of the almost perpetual controversy about oil types and percentages! Gas has its own slight lubricity,

SPECIFICATIONS

WEIGHTS & DIMENSIONS

Capacity	2.549ci (41.779cc)
Bore	1.579 ins. (40.1mm)
Stroke	1.302 ins. (33.07mm)
Stroke/bore ratio	0.825:1
Timing periods	Exhaust — 148
	Transfer — 106
	Sub-piston induction
	Inlet opens — 110° ABDC
	Inlet closes — 70° ATDC
	Total period—140°
	Blowdown — 21°
Combustion volume	4.9cc
Compression ratios	Geometric - 9.53:1
	Effective - 6.87:1
Exhaust-port height	0.405 in. (10.3mm)
Cylinder-head squish	0.060 in. (15.2mm) approx.
Cylinder-head squish angle	0
Squish-band width	From 0.430 in. to 0.06 in. at front of cylinder
Carburetor bore	0.436 in. (11.08mm)
Crankshaft diameter	0.500 in. (12.7mm)
Crankpin diameter	0.403 in. (10.25mm)
Wristpin diameter	0.312 in. (.7.94mm)
Crankshaft nose thread (front)	0.312 in. x 24 TPI r/hand (5/16 ANF)
Crankshaft nose thread (rear)	0.310 in. x 18 TPI l/hand (5/16 ANC)
Wristpin diameter	0.236 in. (6mm)
Connecting-rod centers	2.38 ins. (60.5mm)
Engine height	6.8 ins. (173mm)—flywheel/cyl. head
Width	5.7 ins. (145mm)—carb. cover/fins
Length	6.25 ins. (159mm) (prop. driver/radial mount)
Radial mounting-hole dimensions	2.32x2.32x4 ins. (0.246 in. x20TPI)
Exhaust-manifold bolt spacing	Horizontal — 1.39 in. (35.3mm)
	Vertical — 1.027 in. (26.1mm)
Frontal area	17.5 square inches
Overall Weight	41 lbs., 12 oz. (2.15 kilo.)
Crankshaft weight	7.90 oz. (225gms)
Rod weight	1.20 oz. (33gms)
Piston weight	1.75 oz. (50 gms)
Little-end rollers (18 off)	0.065 in. (1.67mm)
Little-end eye	0.445 in. (11.3mm)
Big-end rollers (11 off)	0.1565 in. (3.975mm)
Big-end eye	0.718 in. (18.2mm)

Performance:

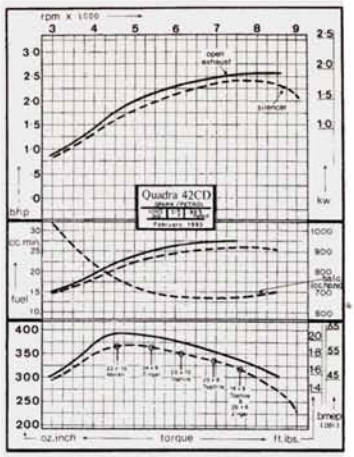
Max. B.hp	2.61 @ 8,561rpm (open exhaust)
	2.40 @ 7,601rpm (standard muffler)
Max. torque	390 ounce-inch @ 4,443rpm (open exhaust)
	372 ounce-inch @ 5,015rpm (standard muffler)

RPM on standard propellers	**O/exhaust**	**Std. muffler**
22x10 Merati	4,767	4,653
24x8 Zinger	5,675	5,410
20x10 Top Flite	6,301	6,165
20x10 Kavan	7,021	6,630
20x8 Top Flite	7,149	6,960
20x6 Zinger	7,896	7,644
18x8 Top Flite	7,975	7,660

Performance equivalents	**O/exhaust**	**Std. muffler**
B.hp/ci	1.02	0.94
B.hp/cc	0.06	0.057
oz.in./ci	152.90	145.90
oz. in./cc	9.33	8.90
oz. in./lb	184.80	78.30
ft. lb./ci	0.79	0.76
B.hp/lb	0.56	0.50
B.hp/kilo	1.27	1.11
B.hp sq. in. frontal area	0.15	0.137

Manufacturer: Aerrow Inc., P.O. Box 183, Perth, Ontario, Canada K7H 3E3.

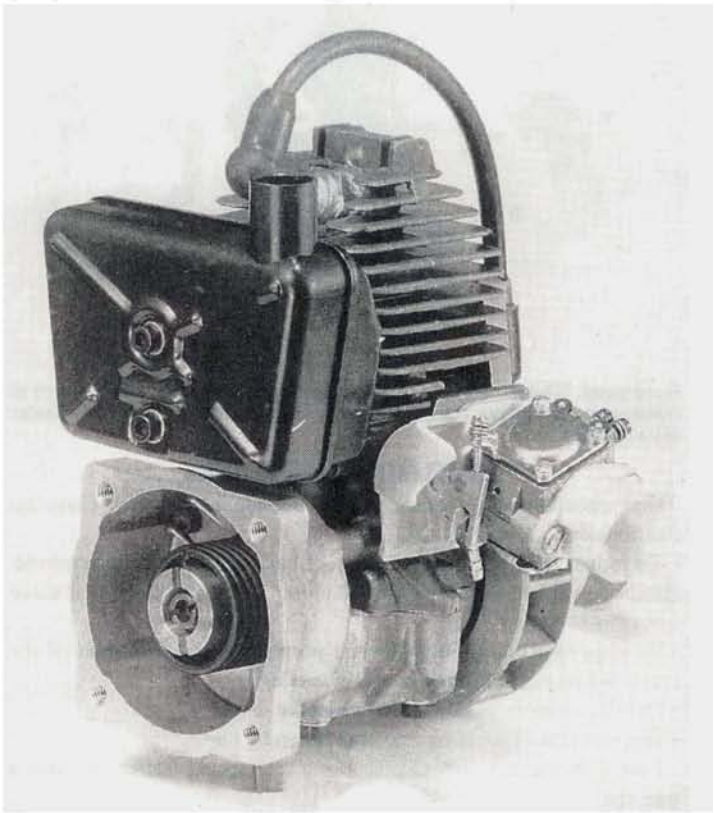
whereas methanol has none, so it's the methanol that requires the oil, not the engine *per se*. But if you use methanol instead of gas, your fuel consumption will be twice as high—expensive stuff, this methanol.



The engine's great torque was soon obvious, even at rpm as low as 3,000. The maximum value of 390 ounce-inch (2 foot-pound) occurred at 4,443rpm; B.hp started to flatten out at the tester-imposed rpm limit of 8,561 (imposed to ensure the engine's survival for the more important muffler tests).

Test 2. Standard muffler. Fuel as in test 1.

This is the standard industrial muffler—a very simple, small, expansion-box style, which could only be expected do a minimal sound-reduction job. In fact, as the dB chart shows, reductions ranged from 6dB to 8dB—quite meaningful, but still not quiet enough to meet AMA and UK regulations (90dB at 9 feet and 82dB at 7 meters). With a 20x8 Top Flite propeller and those low 6,200rpm, I thought the noise produced was enough to be regarded a nuisance—a factor that should be addressed.



The recoil-spring starter lurks inside a beefy radial mount. The small box muffler effectively reduces sound.

The prop rpm and torque values noted attest to the restrictive effects of this small unit, but to reach the officially acceptable dB levels, you'd have to reduce rpm even further or fit an extra muffler.

Even with this muffler, maximum torque (372 ounce-inch) was significantly higher than that produced by early Quadra 35s (282 ounce-

(Continued on page 50)

MODEL AIRPLANE NEWS MAGAZINE
FIELD & BENCH REVIEW

SPITFIRE

FUN-SCALE WARRIOR

by DAVE WINDOM

WHEN I THINK of classic warbirds, two WW II veterans come to mind: the P-51 Mustang and the Spitfire. It's true that the Mustang is a good-looking aircraft, but the Spitfire has the elegance that few aircraft have ever matched. Each line of the Spit flows into the next; its whole demeanor suggests fluid motion.

Dynaflite's* Spitfire—like the other kits in their Fun Scale line—was designed to be an easy-to-build, fun-scale version of a subject that, given the elliptical wings, can be a rather difficult scale topic.

Margaret Aarstad poses with the Spitfire.

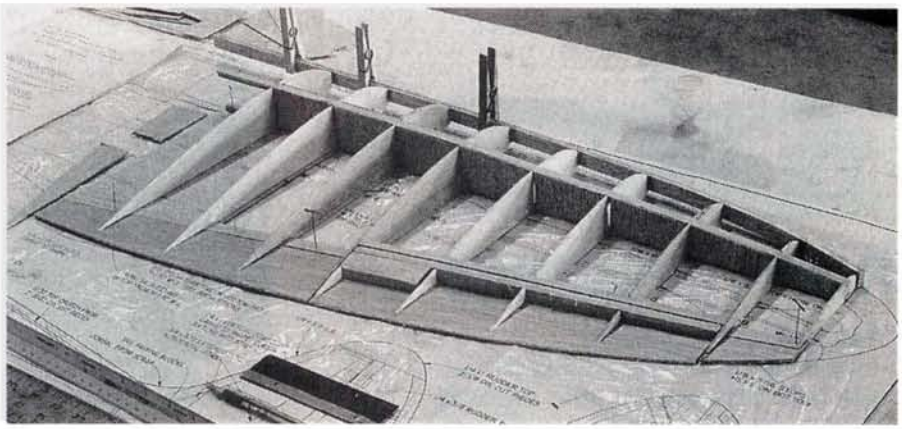
PHOTOS BY DAVE WINDOM

THE KIT

Overall, I was impressed with the kit's quality. It includes lots of balsa, some die-cut birch and lite-ply. Not all the die-cutting was perfect—some pieces needed to be coaxed out with a razor knife—but enough pieces came out easily, so I was happy.

The clear canopy is well-molded, and it resembles the canopies on most Spitfire models through the Mk 21. The 23-page instruction manual includes three-views of the Mk I and Mk IIa. The folded plans are on one sheet. The hardware bag includes lots of parts, such as hinges, links, quick connectors and a really neat set of Dynaflite Zip Horns.

Dynaflite



Note the laminated leading edge on the wing panel.

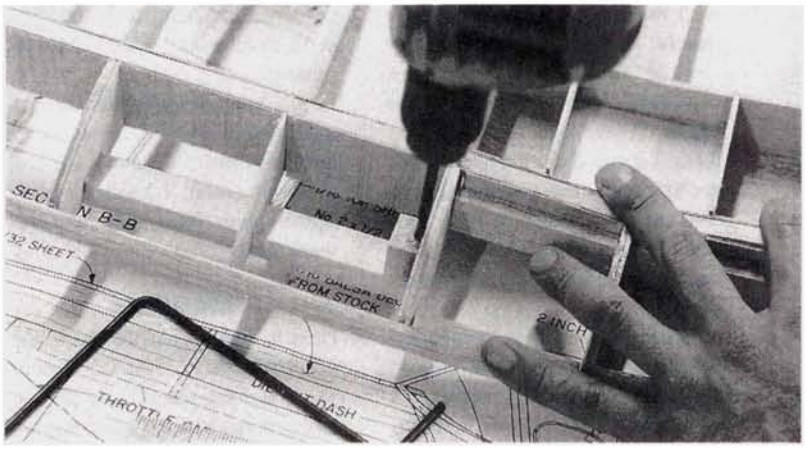
CONSTRUCTION

The Dynaflite Spitfire construction method solves some problems that are unique to building its elliptical wing and tail, and it also allows you to build a very light plane. You must pay attention to the instructions because there are no construction photos included (just a few line drawings). I got out of sequence a couple of times and had to tear some things apart to fix my mistakes.

Although the kit uses die-cut parts, the round shapes are formed by sanding—lots of sanding. Several grades of sandpaper and sanding aids, such as a T-bar, are essential.

• **Tail.** Instead of sheet stock, the kit uses laminated die-cut pieces and diagonal braces in an open-bay architecture for the tail surfaces.

• **Wing.** The beautiful elliptical wing uses laminated wing spars and leading edges. The "D-tube"-style wing uses shear webbing, and it's built flat on the building board. I used wood glue. (It makes life easier when you need to sand laminated surfaces and sheeting.)



Author drills gear mount hole in wing.

SPECIFICATIONS

Model: Spitfire
Manufacturer: Dynaflite
Type: Fun scale
Sug. price: $119.95
Wingspan: 56 inches
Wing area: 567 square inches
Weight: 4½ to 5 pounds
Wing loading: 19 to 21 ounces per square foot
Engine: .30 to .50 2-stroke; .40 to .60 4-stroke
No. of channels req'd: 4

Features: die-cut parts, landing-gear wire, canopy and all basic hardware. Laminated leading edges and spars are used to achieve the unique Spitfire wing shape.

Hits
- Easy to build; lightweight construction
- Good landing manners
- Good overall wood quality and die-cutting

Misses
- The kit lacks decals; it should include roundels, at least.
- The instructions include line drawings but no photos; photos would help the builder in areas where the instructions are not perfectly clear.

The ailerons are controlled via a single cable that passes from one aileron to the other through the wing panel and a quick connector and out through the other wing panel. Be very careful when you cut this cable; you only get one shot at it. Cutting it too short means a trip to the hobby store.

To cut and sand the wingtips to shape, I traced the outline of the wingtips on tracing paper, sprayed the paper with adhesive and applied it to the wingtip stock. Then, I cut the outline with a band saw and removed the tracing paper.

• **Fuselage.** The tapered fuselage—although somewhat round—is of box construction. The engine is bolted to plywood pads that, in turn, are bolted to hardwood beams that extend through the first former. This automatically sets 3 degrees of downthrust.

After the formers had been put in and the fuse sides joined, I added the top sheeting by tack-gluing the bottom edge to the top of one side of the fuselage. To achieve a smooth contour, I wetted the sheeting with water and wrapped the whole assembly with rubber bands until it was dry. The plans called for the addition of a cowl hatch built with 1/16-inch wire and a ballpoint-pen spring.

The framed-up Spitfire.

• **Coloring/finishing.** I covered the bottom surfaces with sky-blue MonoKote* and the top surfaces with olive drab MonoKote.

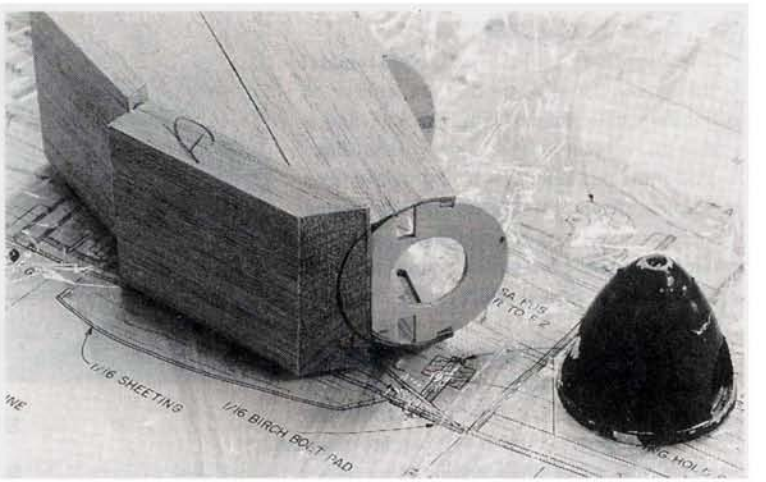
FLIGHT PERFORMANCE

- **Takeoff and landing**
The wider-than-scale landing-gear location provides better ground handling than I anticipated. Whether your takeoff runs are long and scale-like or very short with immediate application of full power, you'll still have enough rudder authority to keep your plane pointed down the runway. As with most tail-draggers, it handles better off grass fields than off pavement. Landings are easily managed. The Spitfire has relatively low wing loading, and it floats quite a way before touching down. Hold full up-elevator on roll-out to prevent noseovers.

- **High-speed performance**
At full throttle, the Spitfire really screams. Half to three-quarter throttle on my Royal .46 was plenty. With the rates set to low, the Spitfire responds well to "yank and bank" flying without tip-stalling. It does have a flat-bottom airfoil, and with application of power, it tends to climb. With the rates set on high, the plane is very quick around the roll axis, but still is not too touchy. The rates recommended in the instructions are between these two settings and would work well for general flying.

- **Low-speed performance**
This is where the plane really shines. With its light weight, the Spitfire can be dragged along just mushing ahead. Stalls really have to be forced; I did not have tip-stalling problems. On one flight, I had no trouble making a couple of tight, deadstick circles around the runway to lose enough altitude to keep from overshooting.

- **Aerobatics**
Loops, rolls, Immelmans and other typical fight-type maneuvers are performed with ease. With a .46 bolted to its nose, the Spitfire has just about unlimited vertical performance. It will easily fly circuits around the field, inverted with moderate down-elevator pressure. With the dual rates on low, the Spit will do a very long, slow roll (if you enter on a slight uphill line as the full-scale might). I had a tough time trying to maintain any kind of knife-edge, owing to some unexpected rudder/pitch coupling. The Spitfire is no pattern ship, but it does give a good accounting of itself as a sport plane.



The rounded fuselage curves require a lot of sanding.

After taping off selected areas, I used spray paint to add gray camouflage coloring.

Here's the only real beef I have with the kit: it doesn't come with decals. A kit such as this really should include at least the roundels. I ordered a set from Major Decals* and, after applying them, I sprayed the top surfaces of the Spit with clear polyurethane to seal the decals and to fuelproof the spray paint. Adding the canopy completed the major construction.

Final assembly included installing the radio. The aileron servo fits completely within the wing, and that leaves a lot of space within the fuselage for the other three servos. My Spitfire balanced with the battery and receiver at the front of the radio compartment.

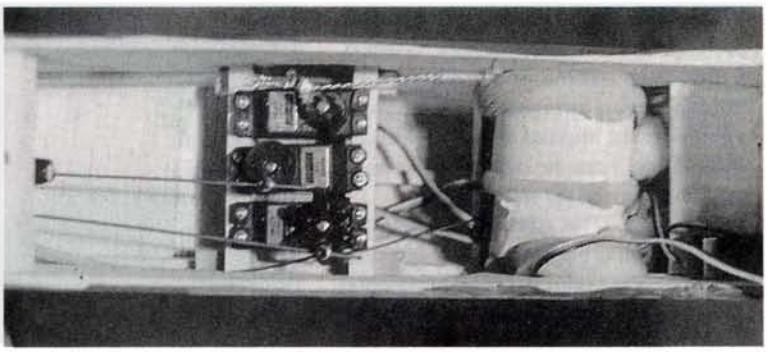
Here's where those neat Dynaflite Zip Horns come into play. Like nylon cable ties, on one strip, they have one-way teeth that slide into a one-way receiving pad. I worked the long strip of the horn through a slit cut in the control surface and then pushed the backing plate onto the strip and tightened it. Then I clipped off the strip excess and connected the pushrod.

The book describes an alternate method that involves epoxying the horn into place. I have used both methods (later, I built a second Spitfire with floats), and they each work well.

CONCLUSION

I really feel Dynaflite has something neat here. The kit is complete, and the plane is an easy-to-build, sharp-looking sport warbird that is very easy to fly.

**Here are the addresses of the manufacturers mentioned in this article:*
***Dynaflite**, 1578 Osage, San Marcos, CA 92069.*
***MonoKote**; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.*
***Major Decals**, 21 Fisher Ave., E. Longmeadow, MA 01028.*



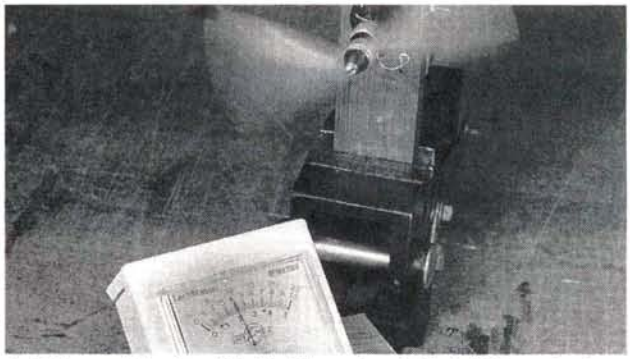
The aileron servo sits in the wing, and the remaining servos have plenty of room in the fuselage.

HOW TO:

RANDY RANDOLPH

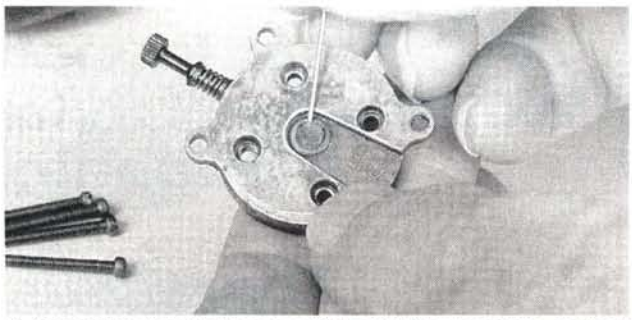
IMPROVE THE COX BLACK WIDOW'S PERFORMANCE

The Cox Black Widow 0.049 engine—which uses the same piston and sleeve as the TD series—is a black-anodized Golden Bee with a twin-port sleeve. The engine is inexpensive and easy to mount. Add a throttle sleeve from Ace* Radio and make the simple modifications described below.*



1. Before modification, this throttle-equipped Black Widow—turning a 6x3 Cox gray prop and running on 10-percent nitro fuel—turned 10,000rpm wide open. The throttle response was such that there was a small mid-range of about 9,000rpm that quickly fell to an idle of 5,000rpm.

2. Using a small screwdriver, remove the four screws that hold the backplate/needle valve and tank to the engine. Empty the tank, and then remove the backplate. (Work over a shop towel in case of fuel spillage.) The small, black O-ring should stay over the end of the air intake built into the tank.



3. Use a pin to remove the screen that covers the hole in the center of the backplate. Although removing the screen alone will vastly improve the performance of the engine, the following modifications will further enhance its performance.

4. Hold the backplate in a vise or on a flat surface, and enlarge the center hole with a 9/64-inch drill bit to remove the flange that holds the screen in place. Clean away all metal chips and reassemble the engine.

5. After being modified, with the same fuel and prop, the engine's top speed in now 12,500rpm. Bonuses include a less sensitive needle valve, a usable mid-range and a reliable 4,000rpm idle—well worth a small effort!

Here are the addresses of the companies mentioned in this article:* **Cox Hobbies, *350 W. Rincon St., Corona, CA 91720.* **Ace R/C Control Inc.,** *116 W. 19th St., Box 511C, Higginsville, MO 64037.*

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects", we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1993. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

A SUKHOI SMILE

Even though Jeff Hughs' Midwest Sukhoi is beautiful, we chose this picture because we think his 7-year-old daughter Emily's great smile will be a *really* bright spot in this "Pilot Projects." Jeff says, "Emily is anxious to see herself in print," and how could we refuse? Well, Emily, are you smiling? The Hughs family lives in Granger, IN.

R/C CARRIER OPERATIONS

This photo of Tim Toutant's Ultimate parked on the flight deck was taken during Operation Provide Comfort. Tim has been in the Navy for 16 years and has been flying R/C for 23 years. He says, "I enjoy your magazine more than all the others because of the technical goodies and write-ups of aircraft." Thanks, Tim, that's what we like to hear! Tim always gets the captain's permission before he does his Sunday flying. We hope he remembers to heed the warning posted on the ship's superstructure.

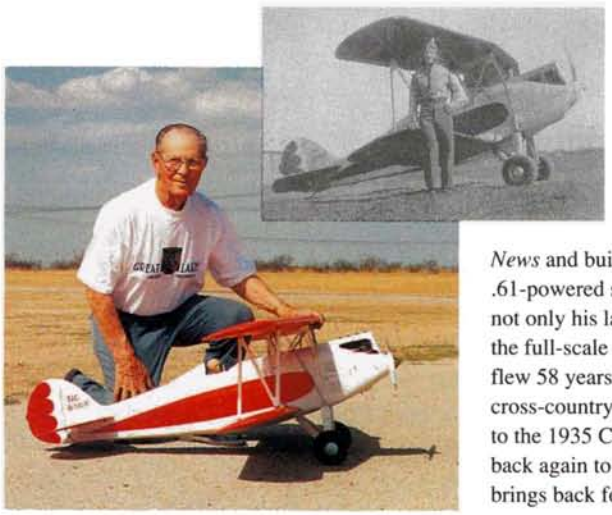
DAUGHTER ON STORM WATCH

Diana Schmitz of Howell, MI, poses with her father Dave's .40 Nosen Citabria. Dave says the Citabria is a great flier with the Super Tigre .45 and an 11x6 prop. Its Super MonoKote keeps it very light. This photo was taken on a windy spring day, and Diana had to literally hold it down to prevent it from being blown away.

PILOT PROJECTS

A PILOT GROWS IN BROOKLYN

Meet nine-year-old Charlie Capozello with his new, low-wing trainer—an Ace T-34 powered by an O.S. .48 4-stroke engine. Charlie has been flying a little over a year, and he and his father, Joseph, are members of Radio Control Society of Marine Park in Brooklyn, NY. Dad says, "Charlie takes off and lands himself, and his T-34 looks and sounds very realistic." Just think, Charlie, with your young reflexes, next year, you'll be flying circles around your proud father. That will make him even more proud.



A HALF-CENTURY OF AVIATON FUN

Eighty-three-year old Cedric Galloway from Hesperia, CA, has been reading *Model Airplane News* and building models since 1932. This O.S. .61-powered scratch-built Great Lakes 2T-1A is not only his latest project, but it's also a model of the full-scale 1932 Great Lakes he owned and flew 58 years ago. Mr. Galloway once flew cross-country from Decker Field in Austin, MN, to the 1935 Cleveland National Air Races and back again to Austin. "Just looking at the model brings back fond memories for me," he says.

AIR-TRAFFIC CONTROLLERS

Future "air police" Jason and Jeff Beetz (8 and 11) from Edgewood, KY, hold their father Jack's full-scale flying stop sign. The Fox .45-powered sign is made of sheeted 1-inch Styrofoam, and it can hover to a stop in a slight headwind (how appropriate!). Jack writes, "The neighbors must have wondered why we were tracing the lettering on the corner stop sign." If they enter this in scale events, they shouldn't have any problems with scale documentation.

THE SILLY CENTURION OF R/C

He's faithfully on guard for his master, Harry C. Roberts Jr. USAF (retired) of Medina, OH. Man's best friend can sense the hours that went into this scratch-built project, and he guards it accordingly. This 15-pound, 64-inch-span model of a McDonnell Douglas demonstrator aircraft, which was proposed in late 1976, uses two O.S. .46 DFs and Jet Hanger fan units. Harry calls the model the "Hawkeye Jet." He didn't tell us what he calls the dog. One thing *is* for sure: this pooch definitely loves the smell of burning castor oil in the morning!

MODEL AIRPLANE NEWS
FIELD & BENCH REVIEW

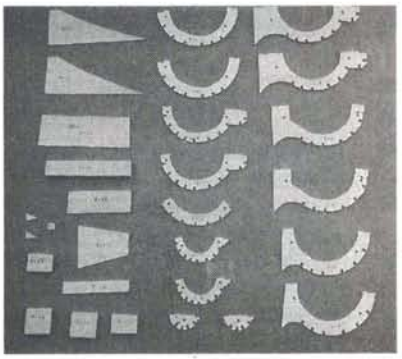
A Golden Age crowd-pleaser

by BILL SEXTON

THE GAMMA was the fourth airplane in a series of John Northrop's designs. It was preceded by the Alpha, Beta and Delta versions. Among the Gamma's many outstanding accomplishments was its achievement in becoming the first airplane to exceed a ceiling of 30,000 feet. It was also the first commercial passenger airplane used by TWA, and it later became the inspiration for Howard Hughes's "Hughes Racer." The model you will be constructing is a prototype of John Hawk's Hawk Racer, which he flew in several Thompson Trophy Races. A two-seater version, the Gamma 2B, was piloted by Leniole Elsworth on a 10-day journey over Antarctica in 1935 during Admiral Richard E. Byrd's expedition to the South Pole.

NORTHROP Gamma Hawk Racer

from Aero Classics



The Gamma's all-balsa construction is more complicated than that of an average R/C sport model. Most of the parts—for example, these fuselage formers—are accurately cut, and that makes the job a pleasure.

The Elsworth is now a part of the Smithsonian's Aviation and Space Museum collection. Most "old-timers," however, remember this beautiful airplane as the mail plane of the U.S. Postal Service during the "golden age" of aviation.

Steeped in history, stable in flight and soft on the eyes, John Northrop's Gamma has always been a crowd-pleaser at any R/C scale meet! Whenever it appears, it has usually been scratch-built by a scale-model enthusiast who is doubtless as much in love with it as you are sure to become.

I am something of a newcomer in the world of R/C building and flying, with only about five years in the hobby. So when a friend of mine, Dixie Cutrone, asked me if I wanted to build a scale model of a Aero Classics* Gamma, I didn't know if I wanted to take on such a project. But after looking at the plans and the instruction book, I told him I'd give it a try.

The instruction book is very detailed and does a good job of covering each step in the building process; it has 32 pages. The wood in the kit was of good quality, and it came with a complete hardware package.

Construction starts with the wing. I did find that some of the wing ribs and trailing edge didn't match up, when placed on the plans, but with a little cutting and trimming it worked out. The wing has slight dihedral that breaks 7 inches from its center, with very good supports for holding it in place. The landing-gear design is excellent. They are very well-braced, with a block and wire going to the back for support. (This way,you have no back-and-forth movement.) The plans called for a single servo for ailerons, but I decided to use separate servos for each one.

The wheel spats that came with the kit are ABS plastic, and they cover the wires for the landing gear, leaving just a little of the wheel showing.

FUSELAGE CONSTRUCTION

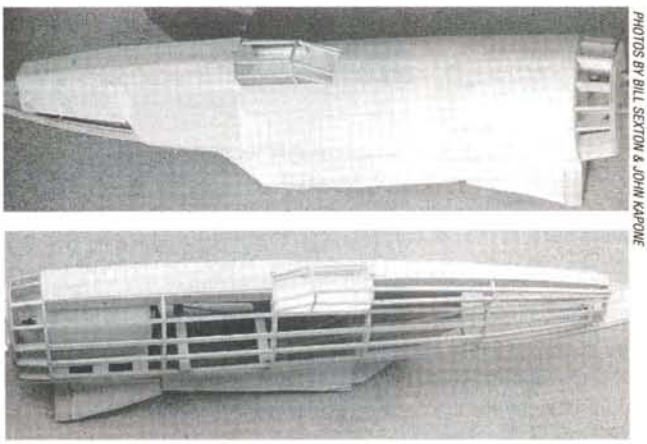
The fuselage framework was a pleasure to make. There are plenty of plywood formers throughout, with notches to place the balsa stringers. With everything in place, the fuselage is very strong and light.

The manufacturer offers an option of stopping at that point or sheeting over the framework. I elected to sheet it, but if I had it to do again, I wouldn't. The frame could still be covered and painted if you like. The bare frame is very strong.

"The instruction book is very detailed and does a good job of covering each step in the building process; it has 32 pages."

Forming the side fairing block was very difficult and time-consuming. I think the manufacturer could come up with a better way of shaping the fairing blocks for you.

With the framework completed, the next step was to mount the engine and cowl. The plans showed a K&B* 61 so this is what I use. The cowl is mounted



PHOTOS BY BILL SEXTON & JOHN KAPONE

The builder can choose to build either a sheeted fuselage or an open-stringer one. Either way, the unit is strong, light and fun to build.

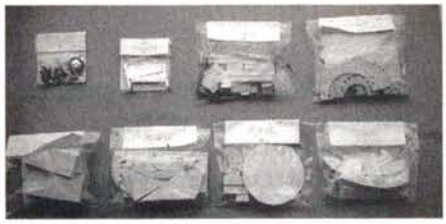
SPECIFICATIONS

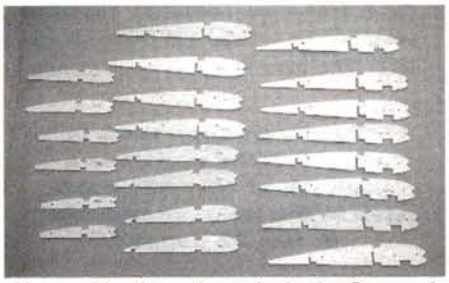
Model name: .Gamma Hawk's Racer
Manufacturer: Aero Classics
Type: Semi-scale
Sug. retail price: $179.00
Wingspan: 72 inches
Wing area: 788 square inches
Weight: 6½ to 7 pounds
Rec. engine: .50 to .60 2-stroke; .60 to .80 4-stroke
Engine used: K&B .61
No. of channels req'd: 4 (ailerons, rudder, throttle, elevator)
Airfoil: Semisymmetrical
Kit construction: Balsa, plywood and spruce

Features: All-wood interlocking construction; 32-page instruction booklet; ABS cowl and wheel pants; complete hardware package.

Hits:
- Forgiving flight performance
- Unique scale appearance
- Strong, light, all-wood construction
- Good packaging and complete instructions

Misses:
- Shaping wing-saddle fairing blocks is difficult and time-consuming
- Some wing ribs had to be trimmed to fit properly





Above: this shows how nicely the Gamma is packaged. Below: though most of the rib cutting is accurate, a few had to be trimmed to fit (see text).

with Sheldon's* Pos-i-Cure CA spacer blocks on the firewall; this allows approximately ¼ inch opening around the back to let hot air out, and there's a hole cut in the top for the engine head. When completed, the head is flush with the cowl and it's clean-looking.

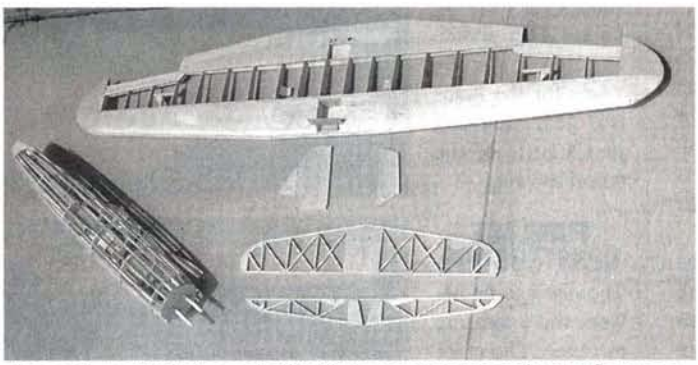
The next step was to mount the muffler on the engine. I didn't want to cut the side of the cowl out and have a muffler sticking out through the side, so I use a (J'Tec* header). This solved the problem of not cutting the cowl, but I still had another problem: the field that I fly at in R/C World, Orlando, FL, has a noise limit of 99dB at 3 meters (like a lot of flying sites), so I drilled two holes in the bottom of the firewall. Then I attached two pieces of silicone tubing to each downpipe on the header block, passed them through the firewall to the inside of the fuselage, ran them along each side to just past the rear wing block with two more holes that came to the outside. Total tubing for each side is 20 inches. Not only does this lower the decibels, but it also helps to keep the plane clean (without any noticeable loss in power because of back-pressure). Measured sound at 3 meters was 97dB (with the K&B 61 with a 12x6 prop).

With the fuselage and wing complete, all that was left was a little sanding. Before covering, I brushed a light coat of Balsarite over the framework. After it had dried, I gave it a light sanding. The covering that I used is Coverite*.

When the covering was complete, it was time to choose a paint. I chose to go with 21st Century* paint. I used aluminum for the wing and fuselage and red for the cowl and wheel spats. With the paint complete, it was time to install the radio system.

The Futaba* Conquest FP-T6 NFK is what I use. With everything completed, checked and rechecked, it was time for the moment of truth: take the plane to the field for the critics to check it out and make their comments.

After I had set up and moved the plane into view, it didn't take long for a crowd to assemble. The first question was, "What is it?" "A Gamma," I replied. "Does it fly?" "I hope so." "You haven't tried it yet?" "Not yet," I replied. "That type of plane will snap on you if you don't keep a lot of power on it," was one comment that came out of the crowd. "Is that a kit?" one guy asked. "Yes, it's an Aero Classics," I said. "You better get some pictures now!" This went on for about 30 minutes but everyone agreed it's a very unusual-looking plane—but it looks *good*.



Its good-quality balsa and all-built-up components make the Gamma a light, unique-looking, superlative flier.

I wanted to get a veteran flier who was experienced with all types of R/C planes, so I asked my friend Dixie Cutrone to test-fly the gamma for me. Yes, we took pictures first!

Till later, good flying to everyone.

**Here are the addresses of the companies that are mentioned in this article:*
Aero Classics Mfg. Co., *RT 1, Box 318, Conoke, AR 72086.*
K&B Mfg. Inc., *2100 College Dr., Lake Havasu City, AZ 86403.*
Sheldon's Hobby Shop, *2135 Old Oakland Rd., San Jose, CA 95131.*
J'Tec, *164 School St., Daly City, CA 94014.*
Coverite, *420 Babylon Rd., Horsham, PA 19044.*
21st Century; *distributed by Coverite.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*

FLIGHT PERFORMANCE

The Gamma was made flight-ready and intentionally slightly nose-heavy for added stability on its initial flight. All testing was done at the R/C World flying site in Orlando, FL. We had Don Lowe, President of the AMA fly the Gamma also—and fly he did, as only he can! What a flier! We first did some engine running to make sure the K&B was tuned-in properly and all seemed to be in order.

- **Takeoff and landing**
  We did a few taxi runs up and down the runway to check the Gamma's tracking capability, and after a couple of degrees right adjustment, it tracked very well. The first takeoff went smoothly—no corrections. The plane tracks very well both on takeoff and on landing roll-out. Landing characteristics were the real surprise this model had in store for us. With its high-aspect-ratio wing and light wing loading of approximately 19 ounces per square foot (!), on landing, this semi-scale bird is a real sport-flier's pussycat. As it turned out, we didn't need the nose weight we added, so it was removed for subsequent flights.
- **Slow-speed performance**
  Here's where Don Lowe took the controls and did some close-in stuff for the camera. Don did some great, slow flybys at just the right angle for those important flight shots by using the rudder to execute some pretty flat turns to do some lazy circles around the field. Some of the turns were so slow and low that it did not seem possible that the Gamma could maintain flight without stalling With the built-in washout, this model is a dream at low speeds; end of story!
- **High-speed performance**
  With its big cowl, big wheel pants and fat, semisymmetrical, high-drag wing, the Gamma is not a bullet, but it is, however, very groovy and crisp at full throttle. Surprisingly, it shows very little need for trim changes during low- to high-speed transitions.
- **Aerobatics**
  The Gamma is fully capable of of fairly axial rolls, slow rolls, split-S's, square-loops, inverted flight and even spins. With its lightness and draggy airframe the Gamma is capable of very scale-like, constant-speed maneuvers. It's very predictable on the down-leg of maneuvers. This model would be perfect for a 4-stroke engine swinging a larger, closer-to-scale prop.

This red and gold Macchi M-67 was designed, built and flown by Matt Pearson. The 52-pound model has a fiberglass fuse and floats and a foam wing.

Top right: a view of the beach and the Nautical Inn Resort.

Bottom right: the flotation test was an opportunity to admire all racers floating side by side on the lake. In front, the little-known CAMS 38 biplane and the obscure Short-Bristow Crusader (the original flew only once)!

4th Annual Schneider Cup RE-ENACTMENT

by GUY REVEL

LAKE HAVASU City, AZ, is known for its London Bridge, its beautiful scenery and its wide choice of leisure activities. Several model manufacturers, including K&B*, chose this quiet city for their operations. Model flying takes place all year long and includes the very popular Float Fly and the unique Schneider Cup Re-enactment.

The brainchild of model designer Bob Martin, the Schneider Cup Re-enactment is hosted by the Desert Hawks R/C Club of Lake Havasu City, AZ. This large-scale competition involves reproductions of the famous Schneider Cup racers of the past.

Below: the Curtiss Hawk belongs to the famous U.S. Schneider Cup racers. It was a modified version of the standard fighter of the era.

RE-CREATING THE FAMOUS RACES

The aim of this contest is to re-create the spirit of the famous full-size Schneider Cup, which took place from 1913 to 1931. Any of the famous seaplanes can be modeled, whether it's a 1913 Deperdussin or a 1931 Supermarine S6b. Linear deviations from scale of up to 10 percent are accepted. This is particularly important for the floats, as some of the earlier designs were far from ideal, and a little design help in this respect can significantly improve water takeoffs.

After being judged for scale and craftsmanship, the models must fly over a timed course where their speed must be as close to "scale speed" as possible (see Rules sidebar). The last part of the competi-

PHOTOS BY GUY REVEL

GIANT-SCALE SEAPLANE AIR RACES AT LAKE HAVASU

Starting a big engine like the Quadra 100 is a "multi-handed" task that requires a strong electric starter.

Same models (Sopwith Tabloid), different sizes!

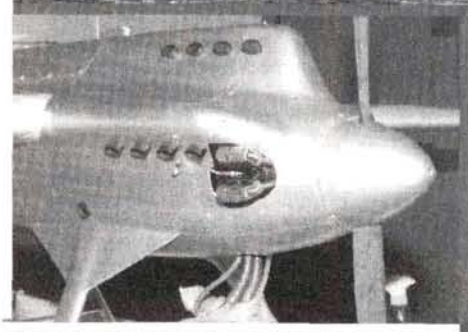
tion is the most spectacular: the models fly, four at a time, over a triangular closed course where they are judged for realism.

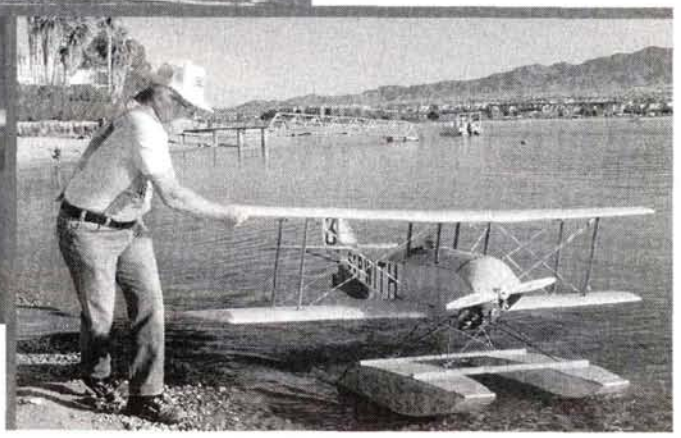
A GREAT SHOW

Presently, the Schneider Cup is the only event of its kind. Like the Madera Races, the Tournament of Champions, or Frank Tiano's Top Gun Scale Invitational Meet, the Schneider Cup is not so much a traditional modeling contest (at least, this is the way I perceive it), as it is a promotional event that brings model flying activities to the general public. Moreover, the Lake Havasu City Council and the city's Tourist Information Services fully support the event, as does the beautiful Nautical Inn Resort, which hosts and sponsors the contest. Model flying is, in effect, an integral part of the activities sponsored by the city to attract visitors. And I must say that it's really an excellent show, especially when several scale racers of the same era are flying together around the pylons.

Left: Don Panek's 1/4-scale S-4 ready to take off. R/C City did the original mold from plugs made by Roy Slater and Ian McInnes. Real teamwork!

Below left: a close-up study of the nose of Don Panek's S-4. The Saito Twin 300's gold-colored rocker-arm covers give an impression of just how big the Supermarine is.





Right: back to the shore after another successful flight. The early biplane racers convey a special atmosphere to the meet.

The latest edition of the Cup attracted a nice variety of models, from the very first Deperdussin of 1913 to the Supermarine S-4. Some rare types were included, e.g., the British Short-Bristow Crusader and the French CAMS-38 flying boat. Most engines had a capacity of 2 to 4 cubic inches, and many were large ignition engines. A notable exception was the very nice 1/4-scale Deperdussin built by Dick Skoglund.

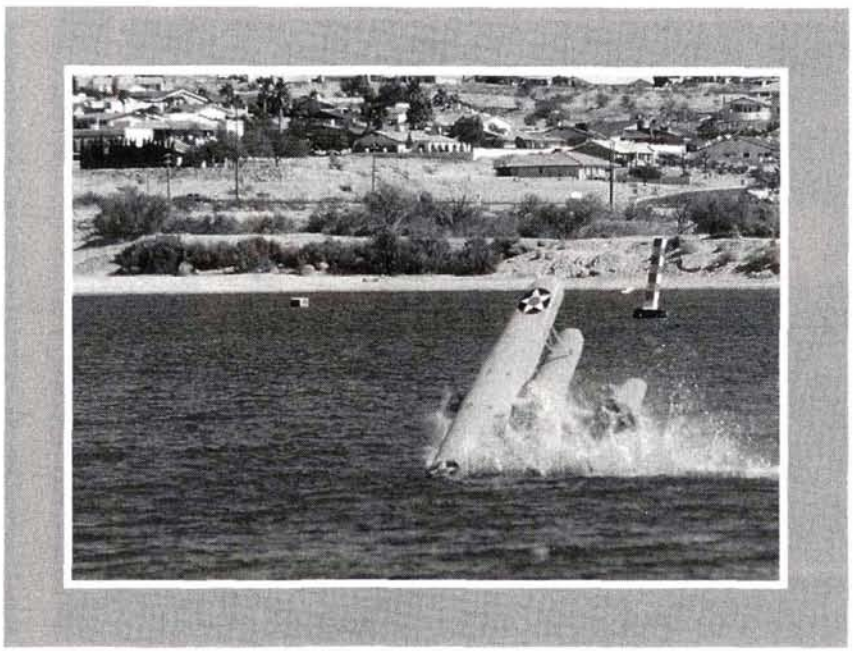
The Cup, which took place the week after the TOC in Las Vegas, was blessed with sunny weather, although the marginally strong wind during the first part of the event was the cause of a severe chop and the cancellation of the speed trials. The conditions improved throughout the weekend so that the races could proceed without any difficulty.

PURE ENJOYMENT

For the second time, a side event was the period costume contest. This is fully in line with the spirit of the Re-enactment and adds immensely to the enjoyment of the participants. And the spectators enjoyed it, too, when a few competitors and helpers were seen on the beach in period swimsuits the following day flying planes or helping out. Although the number of competitors was fewer than Bob Martin had expected, the competition was hotly contested and enjoyed by all.

Worthy of mention was the first female entrant in the history of this event. Cheryl Elder built her own Sopwith Tabloid, and she flew it skillfully. Cheryl, no doubt, had practiced piloting a lot. She mentioned that among her favorite activities is not only building, but also "rebuilding." Sounds familiar to many a seasoned modeler, huh?

With a total of five entries, the delightful Sopwith Tabloid was the most reproduced original. Most of the models used wing warping, which worked well. Also popular was the Supermarine S-4. The Supermarine that was designed and built by Roy Slater and Ian McInnes (McInnes flew it) will now be available in kit form from R/C City* of Tullahoma, TN. It has foam wings and a superb fiberglass fuse.



Splash! JP Lussier's 1/4-scale F6C-3 Hawk produced an impressive, long, white trail when it landed with the port wings just a tad too low for comfort! Not much damage, however.

Another aircraft that captured the spirit of the Schneider Cup was the little-known CAMS 38—the only flying boat in the competition. This gray biplane sported a pusher A&M* 4.2 engine in a pod above the fuse

I was really impressed with this CAMS 38 racer, superbly built by Richard Lucas of Fort Bragg, CA. The 1/8-inch balsa hull is covered with glass and epoxy. Absolutely realistic on takeoff and in flight.

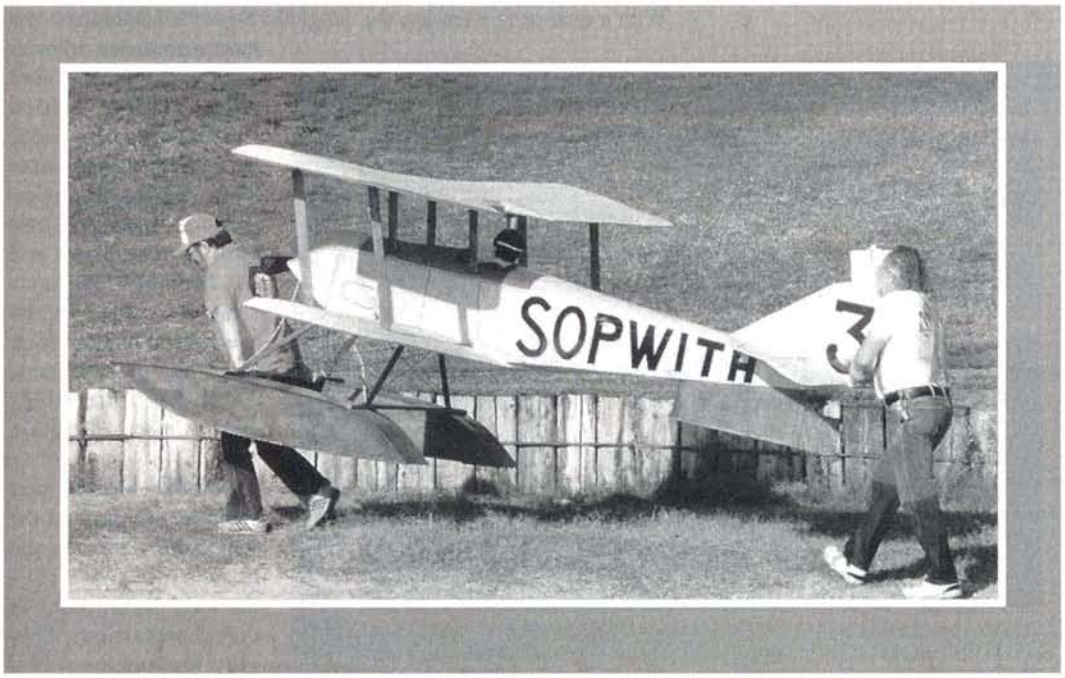
Above: Preparing the Supermarine S-4 before static judging. Excellent surface detail on the fiberglass fuselage. A kit of this model should be available by now. Saito 300 Twin power.

Left: This very nice Curtiss F6C-3 Hawk by JP Lussier was built from Bill Effinger's plans. A Sachs-Dolmar 5.2 really pulls the 39-pound balsa, ply and spruce model.

lage, and it was wonderfully realistic in flight. However, the high-mounted engine vibrated enough to loosen the mounting bolts. No doubt, many full-size aircraft of the era had the same problem! Proper soft mounting will soon solve this problem and make this well-engineered, immaculate model one of the highlights of the next Re-enactment edition.

A NEW ERA OF MODEL FLYING EVENTS

This kind of lower-key competition is becoming increasingly popular as are the numerous fly-ins around the country. Personal involvement with low-key competition is certainly on the rise. This is particularly the case in America, although it is less prevalent in Europe and Japan. Competitions with tight rules, like the FAI events, seem to have much



This absolutely gigantic 1/2-scale Sopwith Tabloid belongs to JP Lussier of Las Vegas, NV. Still waiting for a suitable prop before leaping into the air.

RULES

The Schneider Cup rules demand a balance of scale accuracy and realism but lean toward a general visual impression. Under no circumstances could the Schneider Cup Re-enactment be considered a scale event but, rather, a spectator's event simulating the visual impression and atmosphere of the full-size Schneider Cup of the past. The minimum permitted wingspan is 85 inches, and the maximum weight is 55 pounds. No other restrictions apply

A scale factor is determined by the ratio between the model's wingspan and the original aircraft's span. A 10-percent deviation from scale, in any dimension, is permitted (particularly valuable in float shape and dimensions).

Scale judging is done from a distance of 5 meters and includes accuracy of outline (maximum of 40 points); finish, color and markings (maximum of 30 points); and craftsmanship (maximum of 30 points). Flight judging includes time trials and simulated pylon racing. Time trials are flown over a timed, straight course, and the pilots must try to fly it at a scale speed.

Scale speed is defined as 80 percent of the original aircraft's winning speed during the Schneider Cup in which it was entered. This is multiplied by the scale (there is a minimum speed of 30mph). For example, for a 200mph full-scale aircraft, the target speed for a 1/4-scale model would be 50mph. If the original aircraft did not complete a race, scale speed is considered to be 80 percent of the winning speed of the race in which it was to fly. In time-trial scoring, exact speed is worth 50 points. Every percent of deviation is downgraded by 1 point. In simulated races, four models are flown per heat. Models are judged by the realism of the model on the water and in the air.

The fierce lake chop was not very helpful on the first day, but most models coped easily. Bill Curry's winning Supermarine S-4 takes off from beautiful Lake Havasu.

less appeal to the general public and to modelers. While admiring the champions, modelers often prefer to attend the kind of competitions where they feel they have a chance to place, without a need for the hard training absolutely necessary in FAI.

Admire the gorgeous finish and detailing on the unusual French CAMS 38—in my opinion, the most interesting model this time, despite many other beauties.

Such are our modern times—so many like personal involvement and have a desire to win but do not want to mount the rigorous effort necessary to reach the highest level. The result, however, is quite interesting, as it provides a variety of events and models. This trend may eventually lead to a new class of true sporting competitions completely different from so many of the present ones that are exclusively based on accuracy and/or speed. Time will tell.

[Editor's note: the next Schneider Cup Re-enactment will be held on November 12, 13 and 14 of '93. This event will include the London Bridge Seaplanes Classic, in which any R/C plane capable of flying off water may participate. For further information, contact Bob Martin at (602) 855-6900.]

**Here are the addresses of the companies mentioned in this article:*
***K&B Mfg. Inc.,** 2100 College Dr., Lake Havasu City, AZ 86403.*
***R/C City,** 215 Big Springs Ave., Tullahoma, TN 37388.*
***A&M Aircraft Corp.,** 1428 McArthur, Ste. 102, Carrollton, TX 75007.*

ENGINE REVIEW

(Continued from page 26)

inch), and it also occurred sooner (5,020rpm—1,400rpm lower).

When we compare the open-exhaust results of the old and new Quadras, it's clear that, with its 20-percent greater capacity, this 42CD engine produces only 12 percent more power, but it offers *38 percent more* torque.

IDLING CHECK

Using a muffler and a 20x10 Top Flite prop, rpm down to 1,250 were possible, but 1,600rpm was a more sensible speed. As is usual with these "pumper" carburetors, there was always a swift pick-up through mid-range to wide open throttle. To achieve this, the final, idle, needle setting was one-and-a-quarter turns open, but for the most power at full throttle, the high-speed needle valve had to be three-quarters of a turn open. (Aerrow advises a slightly richer, safer, one turn open for this main power needle.) Neither needle was sensitive, and both operated predictably.

STARTING & CHOKING

For "hot" starts, the on-board, recoil-spring starter was reasonably effective, but during the fairly cool days of my test period, starting the engine required back-up from my electric starter. When starting from cold, considerable "choking" of the carburetor intake was always required. Even when warm, the engine occasionally required a little choke.

SUMMARY

The performance available from this typical industrial conversion is unlike that of more common model engines. In some ways, it's regrettable that only those who operate large-scale models will have a chance to experience the Quadra 42CD.

The combination of gas and spark ignition, large props at low rpm, firm throttle response after a long idling period, cleanliness of operation, freedom from the usual glow-plug gear (batteries, leads, etc.) and very high reliability make this type of engine worthwhile.

MITCH POLING

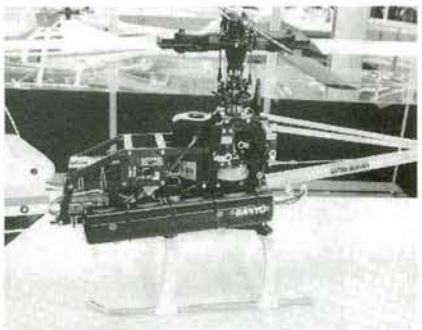
DEVELOPMENTS AT NÜRNBERG

LAST YEAR at Nurnberg marked a surge in electric products, and this year continues the wave. Manufacturers are now developing the larger planes and helicopters. The 100W (05) motors have carried the market for many years. Now the move is to more power, up to 30 cells, equivalent to .60-size glow (1.2hp, 900 watts). This also means more variety than ever before. The Toy Fair is the "kid in a candy store" experience—so much to see that there is danger of overload!

GRAUPNER

Graupner* is a very good place to start. This company has put an amazing amount of research and development into electrics, and this year's products show it. The Sukhoi SU 26 M scale pattern ship is a good example. Not only is this plane beautiful, but it is based on an idea that I think will develop into a trend. It can be built either for glow or electric power. I am sure other manufacturers will soon realize that the larger planes that are designed to fly well as electrics are also suitable for glow. This will benefit everyone: the glow fliers will have strong and lightweight planes that fly better than ever before, and the electric fliers will have a large variety of high-performance planes for the high-power electric systems. The manufacturers' sales will benefit, too!

Graupner's Sukhoi SU 26M scale pattern ship for larger electric systems uses 14 to 18 cells. It could easily accommodate more cells—an Astro 40 would work well. A video showed that it performed very well.



The Heim mechanics and setup for the Trainer E (.40 to .45 glow equivalent) electric helicopter from Graupner. Inset of heli motor shows air fan and cooling shroud. Motor takes up to 24 cells.

The SU 26 spans 57 inches, 739 square inches and has a flying weight of 5.7 pounds as an electric, 4.4 pounds as glow. Sixteen cells and an Ultra 1200 motor fitted with a 2:1 Power Gear are recommended for pattern performance, or a .40 to .45 glow engine. An Astro 40 with up to 21 cells would be a good combination, too. The Graupner video of the electric version demonstrated excellent aerobatics.

The Ultra motors are made by Plettenberg, famous for high-power F3E FAI competition motors. There are Ultra motors available in sizes up to 30 cells. They feature neodymium magnets and brushes that are inside the motor housing. The Power Gear unit is a belt drive (2:1 and 2.5:1 reductions available) that includes motor mounting, for the Ultra motors up to the Ultra 1600 (14 to 16 cells). The Ultra Gear 2:1 is a belt drive that can handle up to the Ultra 2000 (30 cells) and up to 20-inch props. The Ultra 1600-8H is a helicopter motor with a built-in cooling fan and shroud. It can handle 24 cells.

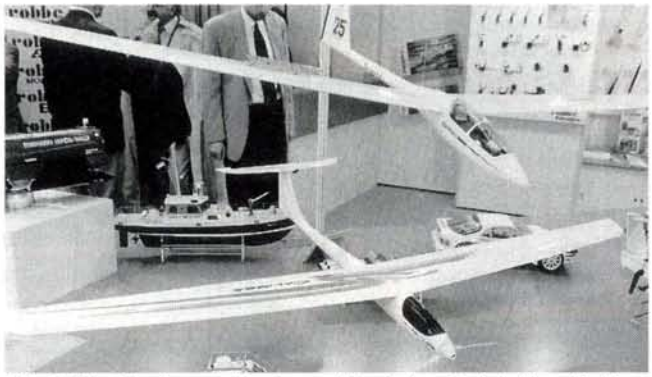
TRAINER E HELICOPTER

Graupner now has a full-size electric helicopter, the Trainer E. I have watched the development of this helicopter during the last three years, and I am very impressed by the care taken to make sure it is right. The performance is very good, comparable to the same size glow helicopters (.45 glow), and uses the same mechanics, made by Heim. Special versions of this helicopter are capable of more than ten 10-minute flights, including fun aerobatics. The rotor diameter is 46 inches; flying weight is 8.8 pounds. The Power MOS 55 Heli throttle or the new mc-Helicontrol 45E are recommended.

The Digimeter MC memory from Aeronaut measures in-flight amperes, volts, rpm, altitude, time and temperature—at up to 21 different points in a flight. The pilot uses one channel to tell the Digimeter when to take a reading. After you land, the data can be read off the LCD or transferred to a personal computer. Projected price is tentatively set at around $200, but this could change.

PHOTOS BY MITCH POLING

The 45E control includes a microprocessor and a Hall sensor to regulate rotor speed, and it can handle up to 28 cells and 45 amperes. The new Graupner Piezo 2000 stabilizing system is a good option for the Trainer E. This is a solid-state gyro system using a prism and solid-state sensors. Last year, Graupner demonstrated a pre-production version using a toy bicycle that could run around all by itself at pedalling speeds. Solid-state construction means super-fast response time, low current consumption and reliability. For the helicopter or the other high-power systems, Graupner introduced the new MC-Ultra Duo Profi computer-controlled fast charger. It will charge up to 30 cells at currents up to 6.5 amperes, ideal for the large power systems. It has a large LCD readout and can peak charge, discharge, and check battery capacity (cycling). Before you put your batteries on a charger, you may want to cool them down, and Graupner has a battery cooler for that, too!



The Calibra-Pro from Robbe is capable of almost straight-up flight on 22 cells.

Cutaway view shows the interior of the Bull planetary system from Marx. The gearbox handles motors of up to 250 watts. The system is shown installed on a 300-Series Marx neodymium motor (approximately 200 watts).

For sailplane fans, Graupner has an "Up and Go" belt-drive unit that retracts the prop and pylon into the fuselage. The unit can handle 8- to 24-cell size motors and props up to 11 inches diameter. A retract servo is used to raise and lower the pylon (see "Air Scoop," this issue). A demo unit was at the Graupner booth, and it got lots of attention! There are several new Graupner sailplanes: the EPS 2002, span 79 inches, almost ready to fly for six or seven cells; the Junior Sport for seven cells, almost ready to fly, span 83 inches; and the Acro Junior, almost ready to fly, span 77 inches for eight to 10 cells. All these planes are very sleek and are intended for the Graupner folding props. The Cosmic is a fun sport-plane kit in the traditional Cub/Taylorcraft style, 47-inch span, for six cells. It is recommended as a starter plane in electrics.

Graupner showed a full line of computer radios and a "sleeper": inexpensive 27MHz systems that are super-narrow-band. These use a 10kHz super-narrow band transmitter and receiver—twice as narrow as the 20kHz "narrow-band" systems that are now required in the U.S. If you would like to use the 27MHz band and want to avoid interference problems, these systems would be well worth considering. The C4-X is 2-channel, the D 8 is 4-channel. I have been flying the D 8 in both Germany and the U.S. and it has been rock solid. These systems also come in European frequencies, so be sure to specify the 27MHz band. The C4-X is also available for 72MHz.

JAMARA TECH MOTOR

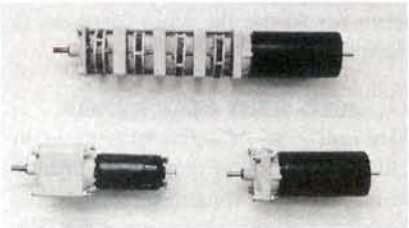
Jamara Modelltechnik* has a new high-power motor, the Tech, available in windings for 10, 14, 20 and 28 cells. The magnets are neodymium-samarium. Operating current is 26 amperes for all models, with 45 amperes peak for half-minute periods. Weights range from 8 ounces for the 10-cell model to 16 ounces for the 28-cell model. Jamara has several electric sailplanes available. The Seroh, 78 inches span, is for 14 cells, but it looks capable of handling more than that. It has obechi-covered Styrofoam wings and a glass fuselage. It looks like the F3E planes that use 27 1000MAh Sanyo SCR cells to fly straight up at 60mph.

SOLAR MOTOR

On the other end of the scale, Jamara introduced the DH1 solar motor. This coreless motor is up to 86 percent efficient and is very popular in Germany for record-breaking endurance and solar planes. It is rated at 20 watts, 1.5 amperes at cruise and up to 14 cells. The usual setup is a 6:1 gear reduction turning a 16x16 prop.

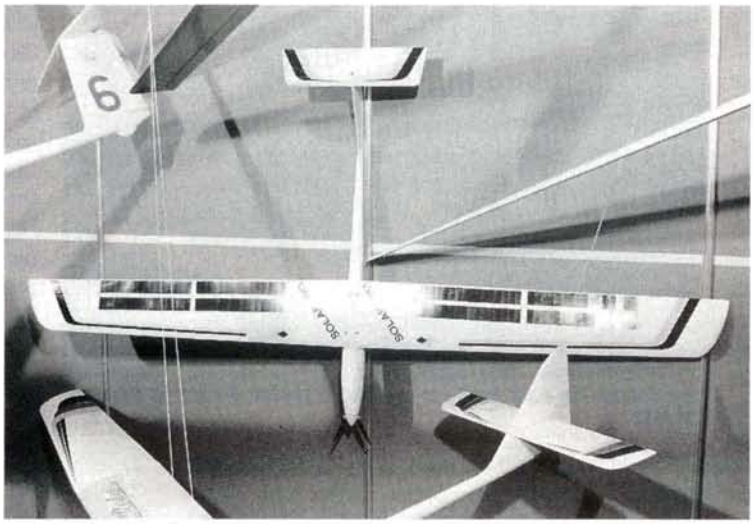
Jamara Tech motors use neodymium samarium magnets. 10- to 28-cell versions are available.

I have been flying this motor with a Marx* Pile 6:1 planetary gearbox and a Schoeberl Moskito prop. This combination can easily do over 1¼ hours on continuous power with a 14-cell 1.7Ah Panasonic battery pack. The flying weight of my plane is 4 pounds, span is 80 inches. Dr. Hackstein established a world record of 10 hours in 1991 with a similar motor and non-rechargeable cells. His record-breaking design, the Sunriser, is also available from



Marx Pile gear systems can be stacked. A single 6:1 unit is a popular setup for solar flight.

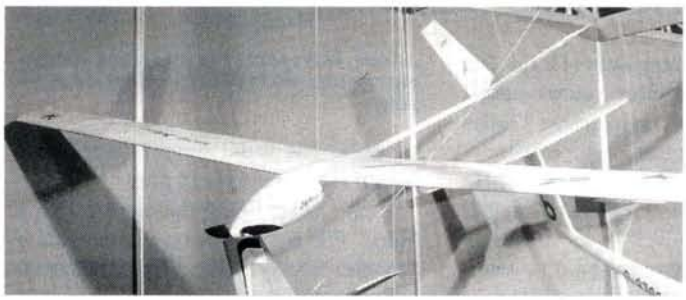
Jamara. It spans 98 inches and can carry up to 24 Sanyo 1.7Ah cells, which gives it a 2½-hour flight capability on the motor run alone.



The Krause RK-1 is a high-performance solar and Ni-Cd-powered plane.

ROBBE CALIBRA

Robbe Modellsport* introduced the Calibra in two versions, a Calibra-Soft, for seven cells, and the Calibra-Pro for "Hot-Liner" flying. Both planes have a premolded fuselage and pre-sheeted foam wings and a span of 72 inches. The Calibra-Pro can fly with up to 22 cells for 80-degree climbs, almost straight up. On the other end of the flying spectrum, the Skyflex is a relaxing change of pace. It is a Rogallo wing powered by a 7-cell motor, span 71 inches. This is an ideal plane for small fields, and the wing can be folded up for transport. It is 2-channel; a speed controller and one servo for tilting the wing for turns is required.



The Krause Electro Jet 2000 is a high-performance 6- to 7-cell plane.

AERO-NAUT GEAR DRIVES

Aero-naut's* new Citabria kit is for up to 250W motors (10 or more cells), span is 62 inches, flying weight 4½ pounds. An Aero-naut gear drive is recommended. The Aero-naut gear drives are very compact and include a motor mount. The gear drives are available in the 60W (Mabuchi 380, "035") and 100- to 150W (Mabuchi 550, "05") sizes, and in ratios from 1.5:1 to 3.0:1. The gear ratios are easily changed by changing the pinion and drive gears.

Aero-naut also has special props for electro-flight, both folding and non-folding. The non-folding props are available in 6- to 9.5-inch diameters and in fiberglass or carbon fiber. The folding props are available in 12.5-, 14.75- and 16.25-inch diameters and in carbon or glass. There is also a line of speed controllers that starts with the Micro 200s for small planes. It is only 1.2 ounces and includes brakes, 30 ampere and 6- to 10-cell capacity, soft start, thermal protection, a BEC and a 3300-cycle high-frequency rate. It is often used for the Speed 400 races in Europe. The BEC eliminates the weight and bulk of a receiver battery pack.

The Speed 400 races have become quite popular; the rules specify the Graupner 400-speed motor and seven cells. These pylon racers weigh only about 1 pound with seven 500mAh Sanyo cells and can hit 60mph around a 300-meter triangular course. The Micro 1200 is the largest in the speed controller series and can handle up to 30 cells. It has an optocoupler, brakes, thermal protection, soft start, 2.5 ounces weight and 3300-cycle rate.

One of the most interesting items for me was Aero-naut's Digimeter MC Memory. This is a unit with a large LCD display that plugs in line between the battery and the motor, and is controlled by one channel. It will record current, voltage, rpm, temperature, altitude and time. It can record these up to 21 times during a flight and read them back on the LCD display or into an RS-232 connection to a PC computer. This memory module will be very valuable to anyone who wants to measure for maximum performance, or to optimize a model design. I want one!

MARX PLANETARY GEAR DRIVES

Marx showed the new Bull-Drive 300 made for high-power motors. This is a compact planetary drive available in 1.6, 2.4, 3.6, 5.6 and 9.0:1 reductions. It has adapters for most motors and can handle up to 250 watts (approximately 12 cells). The Pile-super is a smaller planetary drive, 4:1 for motors up to the Graupner Speed 400 (Mabuchi 300 series). It is suitable for motors in the 60- to 80W range (six to seven cells). The Pile is a planetary gear drive with ratios of 3, 4, 5 and 6:1 suitable for 20- to 30W motors. It is popular for solar power, duration and smaller sport models. I use the 6:1 unit in my duration model.

KRAUSE HIGH-PERFORMANCE PLANES

Krause Modellbau-Technik* had a display of exceptionally sophisticated planes. The Elektro-Jet 2000 is a 78-inch-span vee-tail motor glider with ailerons, for six to seven cells. It is designed for high performance with inexpensive 05 (100W) motors. The fuselage is fiberglass, the wing is sheeted Styrofoam. The Horniss is a "hot" vee-tail

(Continued on page 62)

A REAL BOON TO THE R/C MODELER

Full-Scale Aircraft Reference Books

by JERRY NELSON

DESIGNING AND BUILDING a full-scale, home-built aircraft is not much different from building a giant-scale R/C model. The problems are exactly the same. Since we are not riding in the R/C model, design and building methods are not so critical (not life-threatening). However, the structure and the aerodynamics are the same as if we were building a full-scale home-built. We spend a lot of money and time building a model, and we certainly don't want it to crash because of a structural or aerodynamic problem.

Several books are available on the design and construction of full-scale aircraft. You can use the same information for your models. I've collected many excellent books that will help modelers design an original aircraft or evaluate an existing one. The books are generally of two types—theoretical and practical.

Theoretical books contain information about basic stress analysis, selection of airfoils, what size stabilizer to use, different kinds of flaps, landing-gear placement, weight and balance, estimated performance calculations, stall speed, rate of climb and much more.

The practical books contain helpful how-to advice, e.g., painting techniques and how to hinge a canopy, make a fiberglass cowl and cover with fabric.

I constantly refer to these books; in fact, much of my subject matter for the articles I do for *Model Airplane News* comes from these books. You'll find that they are well worth the investment. A brief description of a few of the books follows.

EVANS LIGHTPLANE DESIGNERS HANDBOOK,
by W.S. Evans,(first edition, 1988),
soft cover, 173 pages,
$25.95 (technical material).
Available from Evans Aircraft,
P.O. Box 744, La Jolla, CA 92037.

William Evans is the designer of the Volksplane VP-1—a small, Volkswagen-powered, single-place, low-wing, home-built. Made out of wood, it is simple and inexpensive to build, and large numbers of them exist throughout the world. As a model, the VP-1 is an excellent subject. Much of the data in the handbook relates directly to the VP-1 design.

The handbook's 15 chapters include information on basic aerodynamic fundamentals with standard math formulas, the strength of materials (wood, steel, aluminum, foam and tubing), flight and stress-load calculations, weight tables for different types of material, and a list of aircraft hardware parts.

Modelers will find a lot of useful information in this book. Included are scale drawings of engine outlines and several sets of coordinates for airfoils that can be used for models. Read about how to determine the tail area and the type of aileron and flaps, and how to calculate theoretical per-

formance data, including the stalling speed. Basic stress information used for designing spars and struts is also included as are the weights of construction material and the dimensions of wheels, tires and rims.

THE SPORTPLANE BUILDER,
by Tony Bingelis, (sixth printing, revised 1987), soft cover, 319 pages, $17.95 (practical material). Available from Aircraft Spruce & Speciality Co., P.O. Box 424, Fullerton, CA 92632 (800) 824-1930, (714) 870-7551.

"The Sportplane Builder" is a must for the giant-scale modeler. Not only is it full of interesting photos of home-built aircraft, but it also includes detailed sketches of linkages, cowls, canopy hinges and locks, cockpit designs, aileron linkages and wing alignment.

Fourteen chapters cover just about everything dealing with the practical side of building a home-built. Hardly any theoretical information is presented—just the nuts and bolts of aircraft construction.

Of particular interest to modelers is the fabrication of cowls and the canopy-installation details. The section on painting is also excellent. Buy this book; you'll be impressed.

LIGHT AIRPLANE DESIGN
by L. Pazmany, (third edition), soft cover, 79 pages, $15 (technical material). Available from Wicks Aircraft Supply, 410 Pine St., High-land, IL 62249, (800) 221-9425, (618) 654-7447.

Mr. Pazmany is noted for his professionally designed all-metal, home-built aircraft. Somewhat complicated to build, they're better designed than many production aircraft. This manual deals with his PL1 and his PL2, two-place, side-by-side, low-wing, trike-gear aircraft.

Many sketches, photos and graphs are included. Don't be intimidated by the aerodynamic formulas; Pazmany's explanations make them easy to understand. Modelers will be interested in the section on airfoil selection, the cockpit design and the theory on how big to make the tail assembly.

LIGHT AIRPLANE CONSTRUCTION
by L. Pazmany, (copyright 1970), soft cover, 92 pages, $15 (practical material). Available from Wicks Aircraft Supply, 410 Pine St., Highland, IL 62249, (800) 221-9425, (618) 654-7447.

This book—the second in a series—deals primarily with aluminum construction techniques. There are many photographs of the Pazmany PL-1 and PL-2 during construction. The jigs and fixtures required to build an aluminum airplane are interesting.

The section on making fiberglass cowls and tips is an excellent modeling reference. It doesn't matter what size you make a fiberglass part; the process is the same. Pazmany goes into great detail about vacu-forming fiberglass parts over a male mold.

ELEMENTS OF SPORT AIRPLANE DESIGN
by P.E. Bird, (third edition), soft cover, 105 pages, $17.95, (mostly theoretical material). Available from Aircraft Spruce & Speciality Co., P.O. Box 424, Fullerton, CA 92632 (800) 824-1930, (714) 870-7551.

This easy-to-understand book on how to design your own aircraft deals with a proposed aircraft—the Vogel Vixen (a golden-era-type of racer). Starting with the general idea of the Vixen, the book covers design selection, the powerplant, construction materials, aerodynamics, structural analysis and even the first test flights.

Most of the material can be used in the design and construction of giant-scale models. The Vogel Vixen would make an excellent R/C model.

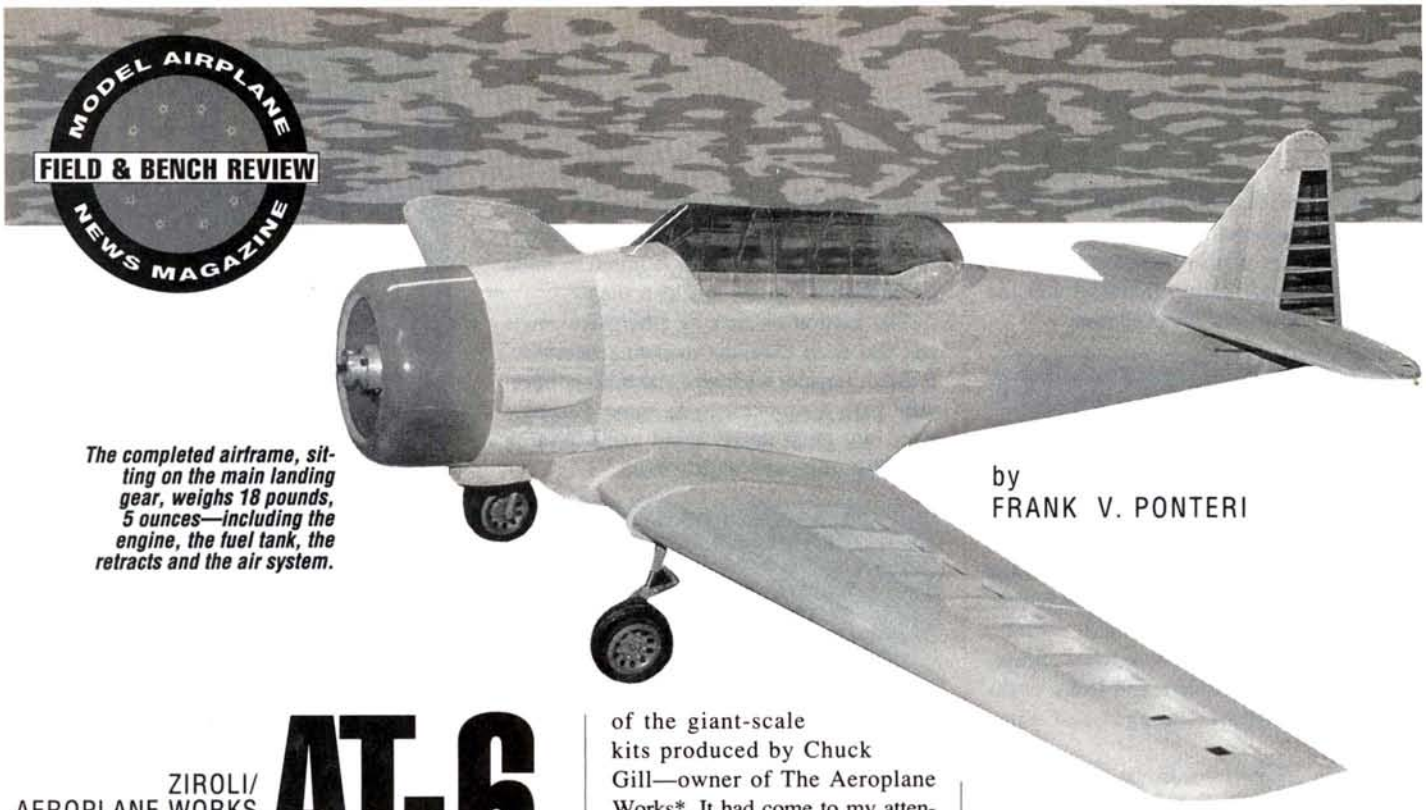
AIRCRAFT SPRUCE & SPECIALTY CO. CATALOG
soft cover, about 350 pages, $5 (practical material). Available from Aircraft Spruce & Speciality Co., P.O. Box 424, Fullerton, CA 92632; (800) 824-1930, (714) 870-7551.

WICKS AIRCRAFT SUPPLY CATALOG
soft cover, about 315 pages, $5 (practical information). Available from Wicks Aircraft Supply, 410 Pine St., Highland, IL 62249; (800) 221-9425; (618) 654-7447.

These catalogs of aircraft materials and supplies also include information about materials, paint application and color charts, interesting tools, fasteners and covering materials. They are very handy reference books and sources of materials for building larger models.

It would be great to buy every book on designing and building home-built aircraft. That probably isn't economical to do. Many of the above-mentioned books deal with the same subject. To get a feel for using full-scale aircraft ideas in modeling, I'd suggest the following books: "The Sportplane Builder," "Elements of Sport Airplane Design," and either of the catalogs. ■

MODEL AIRPLANE NEWS MAGAZINE
FIELD & BENCH REVIEW



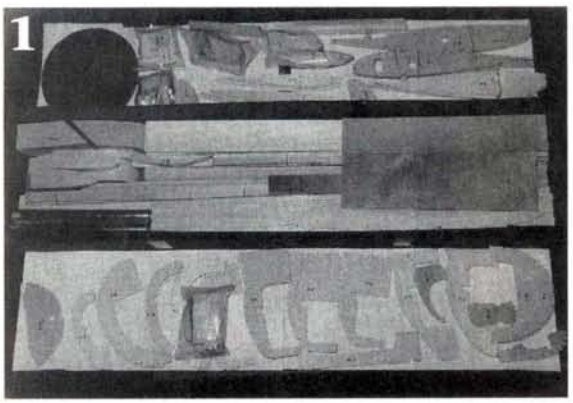
The completed airframe, sitting on the main landing gear, weighs 18 pounds, 5 ounces—including the engine, the fuel tank, the retracts and the air system.

by
FRANK V. PONTERI

ZIROLI/
AEROPLANE WORKS

AT-6 Texan

PART 1



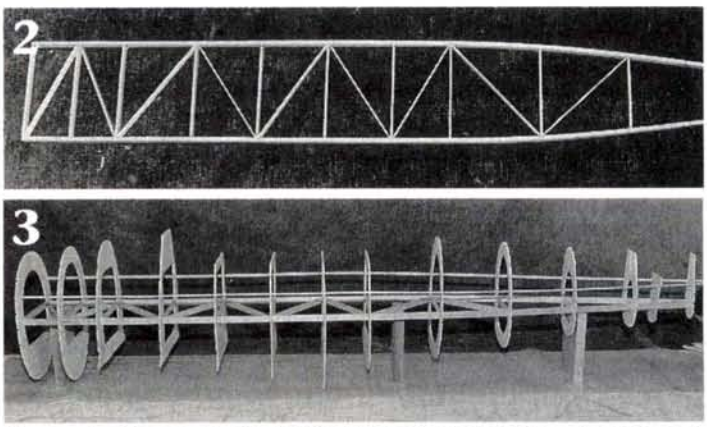
When you open the box, you find many parts. The kit is very well packed, and all parts are numbered and arranged by section. The quality of the wood is well above average.

Editor's note: Frank Ponteri—an avid giant-scale modeler—has been building R/C models since 1956. For readers who might be interested, this AT-6 project has been built to Giant Scale Air Racing Association (GSARA) specifications.

ABOUT A YEAR ago, I was approached by *Model Airplane News*' editor, Tom Atwood, to write a construction article. He asked that I review one of the giant-scale kits produced by Chuck Gill—owner of The Aeroplane Works*. It had come to my attention that Chuck had plans to kit Nick Ziroli's AT-6 Texan, so I called The Aeroplane Works to order this kit. While waiting for the kit to arrive, I began to plan this article. My objective was to give the reader a little more than a "glue part A to B" type of review. I would like to share with you some of the history of this kit and of the people who produced it.

THE DESIGNER

Nick Ziroli* has been building models for over 50 years. In the '60s and '70s, he published dozens of construction articles and many technical articles. In 1967, Nick opened Major Model & Mfg. to produce kits of some of his published designs. His model business led him into the industrial side of modeling. He has developed many R/C feasibility-study models and RPVs for aerospace industries. In '77, Du-Bro* offered Nick one of their new prop drives and asked him to build a model for it. He came up with his giant-scale Corsair. Hooked on giant-scale models ever since, he has developed a broad line of mainly WW II giant-scale plans and accessories. The AT-6 was an early plan and has been a popular one for more



Top: construction begins with building this main fuselage truss, which is used to support all the formers in the fuse. Bottom: the truss is supported with wooden blocks above the bench, and then the formers and stringers are added.

A classic warbird and racer!

than 10 years. With the advent of 1/5-scale AT-6 racing, it should be popular for many years.

THE KIT

In 1991, Chuck Gill arrived on the scene when he opened The Aeroplane Works. Chuck has been involved in R/C since 1958, and since that time, he has written a number of articles for *Model Airplane News*. During the early '70s, he produced many Old-Timer kits. The Aeroplane Works produces wooden kits for all of Nick Ziroli's plans. All of the parts are cut directly from the plan sheets, which means that if the plans are not accurate, the parts will not fit properly. To ensure good quality, Chuck supplies Nick with a prototype kit prior to release. If Nick is happy with the fit of the parts, the kit is released; if not, the plans are corrected and new parts are produced. The result is aircraft kits that have produced good fliers.

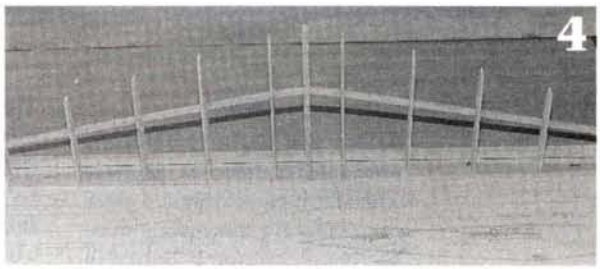
When the original plans for the AT-6 were produced by Ziroli more than 10 years ago, a fixed landing gear was used. Today, most modelers wouldn't consider building this aircraft without retracts. Tom Walker, owner of Robart*, decided to make a retractable landing gear for the AT-6. Using the Ziroli plans as a starting point, Tom designed a near-scale landing gear. Changes had to be made in the wing structure, so he produced a wing modification plan, which was included with the gear. The changes that Tom made in the wing structure have now been made on the Ziroli plans and on the kits produced by The Aeroplane Works.

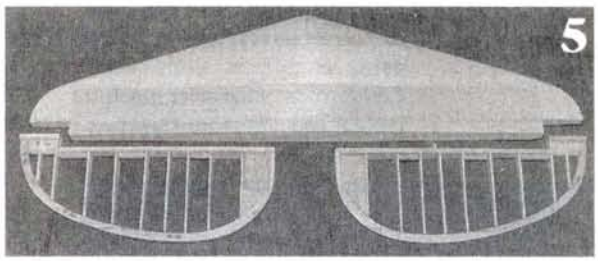
After three weeks of eager anticipation, the component parts of this project—the plans, the cowl and the canopy from Nick Ziroli, a set of no. 161 landing gear from Robart and the kit from The Aeroplane Works—began to arrive at my shop. The kit was promptly unpacked, and the parts were inspected (photo 1). You can see by the photo that the parts are numbered and grouped by section. All of the parts were cut cleanly, with no die-cutting used in production. All of the bulk balsa and plywood supplied was of better-than-average quality. I compared the cut parts with the plans and found them to be accurate. It was now time to take out the glue and begin construction.

"All of the bulk balsa and plywood supplied was of better than average quality."

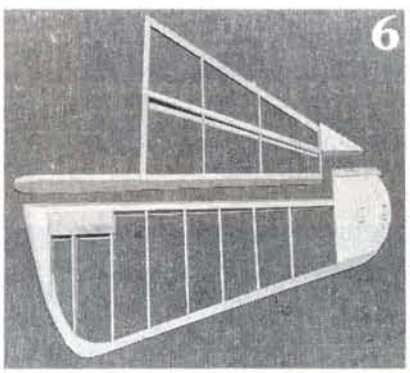
CONSTRUCTION

I began with the fuselage, which is built around a crutch (photo 2). The crutch is then supported above the plan, and the formers and stringers are added (photo 3). The wing and stab saddles are then installed. The next step is to build the tail feathers. The horizontal stab is built in the vertical position over the plan (photo 4). After framing has been completed, the stab is pinned down to the workbench and covered (photo 5). The elevators are fabric-covered. Construction of the vertical stab and rudder is next (photo 6). The vertical stab is sheeted, and the rudder is fabric-covered.

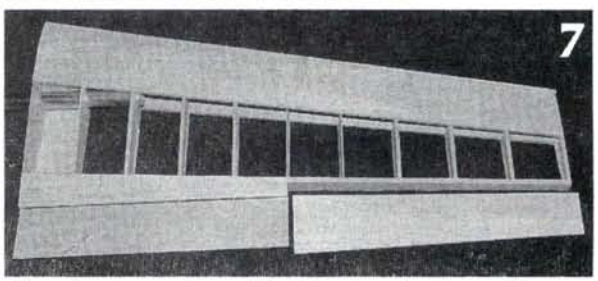




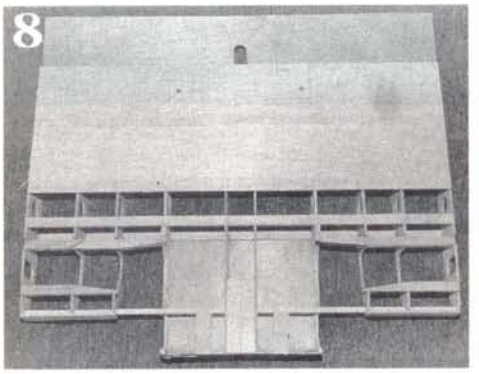
Top: the horizontal stab is built vertically above the plans. When the basic construction has been completed, the stab is pinned down over the plans and sheeted. Bottom: the fabric-covered elevators are built up with tapered ribs and a trailing edge made of four separate pieces.

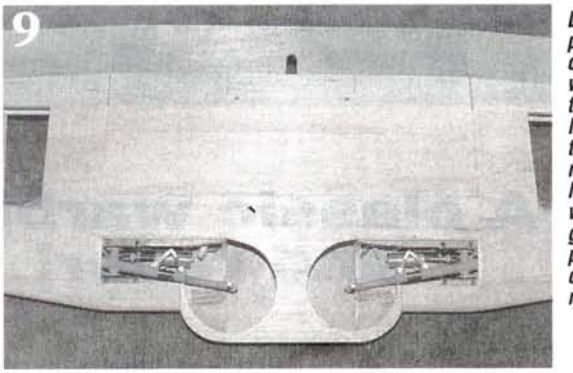


The vertical stab and the rudder are built in the same manner as the elevators. The stab is sheeted with balsa and the rudder is fabric-covered.



The outer wing panels are of traditional construction, and they are shown on the plans with open rib bays that are then covered with cloth. You may wish to plank the wing structure with 3/32-inch-thick balsa.



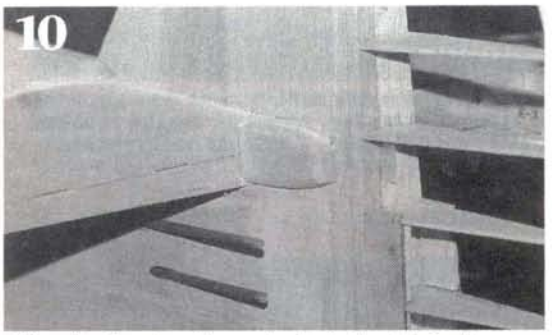


Left: here, we have the partially sheeted wing-center section. The outer wing panels are attached to the center section with large-diameter aluminum tubes. Right: here, the retractable landing gear has been installed in the wing's wheel wells. The gear drops right in with no problems. The ribs come cut for the use of the retracts.

WING

Before you begin to build the wing, choose either the one-piece or the three-piece version. I elected to build the three-piece wing. The center section is bolted to the fuselage with ¼-20 bolts, and the outer panels are attached using aluminum wing tubes. Construction of the outer panels is typical and offers no surprises.

PHOTOS BY FRANK V. PONTERI



After the fuse has been sheeted, the tail feathers are attached and faired in with model filler. It is necessary to install a small fairing block between the elevators and the vertical stab. These were not shown on the plans.

The wing tube is installed in the outer panels prior to sheeting (photo 7). Note that the plans call for the outer panels to be open-structure and fabric-covered; however, I chose to sheet the wings with 3/32-inch-thick balsa (not in photos). Aileron bellcranks are eliminated and one servo is installed in each wing panel to operate the aileron. A separate servo is installed for each flap.

After building the outer panels, begin on the center section. The basic frame is built according to the plans (photo 8). Fit the outer wing panels to the center-section. Plywood sleeves are installed in the center section to accept the aluminum tubes that are installed in the outer panels. The holes are drilled in the center section ribs for the plywood sleeves; however, I found their location didn't achieve the proper wing alignment when the outer panels were installed. A drum sander was used to enlarge the holes so that proper alignment could be achieved. Cut six, 2x2-inch-thick plates (scabs) out of 3/32-inch-thick plywood, and make in each one a hole with a diameter slightly larger than that of the plywood sleeves. The center section is then fastened to the workbench, and the plywood sleeves are slid into place, but not glued. As the sleeves are slid into place, the scab—which is later epoxied to the rib—is slid over the sleeve at each rib location.

The outer panels are now slid into place and jigged for proper alignment. Do not glue the scabs in to place until you're happy with the wing alignment. When you've achieved the proper alignment, epoxy the scabs to the ribs. For added strength, I also used some 2-ounce fiberglass around the plywood sleeves, the scabs and the ribs. After the glue has dried, the balance of the outer wing panel attachment can be completed. This

S P E C I F I C A T I O N S

Model name: Ziroli design, AT-6 Texan
Manufacturer: The Aeroplane Works
Wingspan: 101 inches
Length: 70 inches
Weight: 25 to 30 pounds
Wing area: 1,500 square inches
Wing loading: at 25 pounds, 38.42 ounces/square foot
No. of channels req'd: 6 (with flaps and retracts)
No. of servos used: 8
Power req'd: 3.7 to 4.2ci or larger
Engine used: Stock Zenoah* G-62 (required for air races)
Recommended prop: Zinger* or APC* 22x10
Kit construction: built-up, using balsa and plywood, finished with fiberglass cloth.
Price: $300 ($10 S&H in the continental U.S.) Nick Ziroli plans: $32, fiberglass cowl: $30, clear plastic canopy: $20.

Features: the kit comes with all the wood materials to build the model, plus the aluminum wing-joining tubes. All parts are hand-cut and then precisely sanded to final shape with the use of master templates. The wing is designed to accept Robart retracts. The wing can be built as one piece or three pieces with plug-in outer panels.

Hits

- The quality of the wood supplied is very good, as is the parts fit when building.
- The cowl and canopy from Nick Ziroli are very good; the canopy is clear and the cowl has only a minimum of pinholes.

Misses

- The aluminum wing-joining tubes in the review kit lacked an aluminum or fiberglass sleeve for the tubes to slide into. *[Editor's note: the manufacturer is now including a wing tube alignment scab package in each kit to make aligning the wing parts easier. Included are 1/8-inch-thick A/C plywood scabs (doublers) to be used as described in the text.]*

includes a ¼-inch-diameter plywood roll pin at the leading edge and a ¼-inch-diameter brass pin in the aft section of the wing. *[Editor's note: wing-tube alignment scabs made of ⅛-inch A/C ply are included in all AT-6 Texan kits.]*

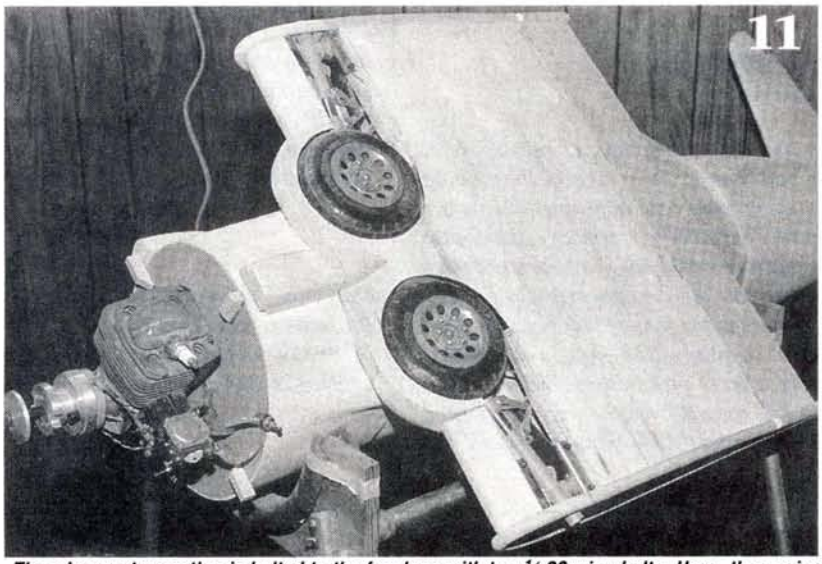
LANDING GEAR

Two Robart air tanks are installed in the center section next to the center ribs. The top sheeting is then installed. (photo 9) The installation of the landing gear posed no problems. It didn't come as a surprise to me that the landing gear covers weren't shown on the plans. My wife doesn't do windows, and Nick Ziroli doesn't do gear doors. The outline for the gear doors can be found on the Robart plans that come with the gear. Photo 9 shows the completed center section with the gear installed before the doors are attached.

After the center section has been completed, it's time to sheet the fuselage and mount the tail feathers. It's necessary to install fairing blocks between the elevators and the vertical stab (photo 10). (The blocks aren't shown on the plans.) Prior to sheeting the fuselage, the pushrods are installed for the elevators and pull-pull cables for the rudder. I prefer to use one servo for each elevator. Upon completion of the sheeting, the cowl is attached, and the canopy is laid into place. It's now time for a trip to the scale. The framed weight of the aircraft—which includes landing gear, G62 engine, fuel tank and completed landing gear air system—is 18 pounds, 5 ounces (photos 11 and opening photo). I see no problem in completing this aircraft at 25 pounds—the minimum weight allowed in the AT-6 races.

With the exception of a few problems in the center section, all of the cut pieces fit with little or no modification. The bulk balsa and plywood supplied were sufficient to build the aircraft according to the plans. I would recommend that anyone building this model obtain a Squadron/Signal Publications* AT-6 Texan book, or one that's similar, to help with some of the details that aren't quite evident on the plans. In the hands of an experienced builder, this kit will produce a fine flying model. If Chuck Gill or Nick Ziroli produced an instruction manual for this kit, it could be built by the average modeler.

In Part 2 of this article (scheduled for a future issue), I will cover the application of fiberglass and paint to the aircraft, and I'll discuss the test flights.



The wing center section is bolted to the fuselage with two ¼-20 wing bolts. Here, the engine landing gear and the center-section flap have been installed, as well as the dummy air scoop made of balsa.

*Here are the addresses of the companies mentioned in this article:

The Aeroplane Works, *2134 Gilbride Rd., Martinsville, NJ 08836.*

Nick Ziroli Models, *29 Edgar Dr., Smithtown, NY 11787.*

Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*

Robart Mfg, *P. O. Box 1247, 310 North 5th St., St. Charles, IL 60174.*

Zenoah; *distributed by ISC International, P.O. Box 40116, Indianapolis, IN 46240.*

Zinger; *distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710*

APC Props; *distributed by Landing Products, P. O. Box 938, Knights Landing, CA 95645.*

Squadron/Signal Publications Inc., *1115 Crowley Dr., Carrollton, TX 75006* ■

ELECTRICS

(Continued from page 54)

pylon model for seven 1.0Ah cells and a Speed 500 motor (100 watt). The span is 35 inches, the fuselage is fiberglass and the wing is sheeted Styrofoam. These planes are capable of 100mph speeds. The Solar RK1 is a high-performance sailplane that will handle 10 cells and can be flown with solar cells plus a Ni-Cd battery. It has ailerons, unique for a solar plane. The span is 85 inches, the fuselage is fiberglass, the wing is monocoque fiberglass, with an Eppler 387 airfoil. The usual flying weight is 4.4 pounds. The Cargus is a high-performance T-tail with an 85-inch span, for eight to 10 cells. The fuselage is fiberglass and the wing is sheeted foam, Eppler 387 airfoil. This plane looks much like the "hotliner" planes popular here, and I suspect that with carbon fiber added to the wings, it could easily fly with more cells and nearly vertical performance.

This is a description of only part of what was shown at Nurnberg, but I am out of space! The trend is clear: there is more and more performance available in electrics. Enjoy! Many of the Graupner and other products are available at Hobby Lobby*. You might ask for their catalogue; it is free!

**Here are the addresses of the manufacturers mentioned in this article:*
***Graupner**, Postfach 1242, D-7312 Kircheim-Teck, Germany.*
***Jamara Modelltechnik**, Gewergebiet 5, D-7974 Aichstetten, Germany.*
***Marx**, see Hobby Lobby.*
***Robbe Modellsport**, Postfach 11 08, D-6424 Grebenhain 1, Germany.*
***Aero-naut Modellbau**, Stuttgarter Strasse 18, Postfach 11 45, D-7410 Reutlingen, Germany.*
***Krause Modellbau-Technik**, Schelmenbergstrasse 33, D-7928 Giengen-Hohenmemmingen, Germany.*
***Hobby Lobby**, 5614 Franklin Pike Circle, Brentwood, TN 37027.*■

AIRWAVES

(Continued from page 8)

Tom and Dan reply that, in retrospect, if they had it to do over again, they would have spent more time adjusting the engines to ensure reliable performance. They also note that you would have to have been there to appreciate what happened and the circumstances at the flying field. You don't just "dump" a plane like that in the trees! Finally, cherry pickers have been used to pluck R/C models from the trees in question without incident. One thing is certain, the Starship article generated a lot of diverse reader comment! TA

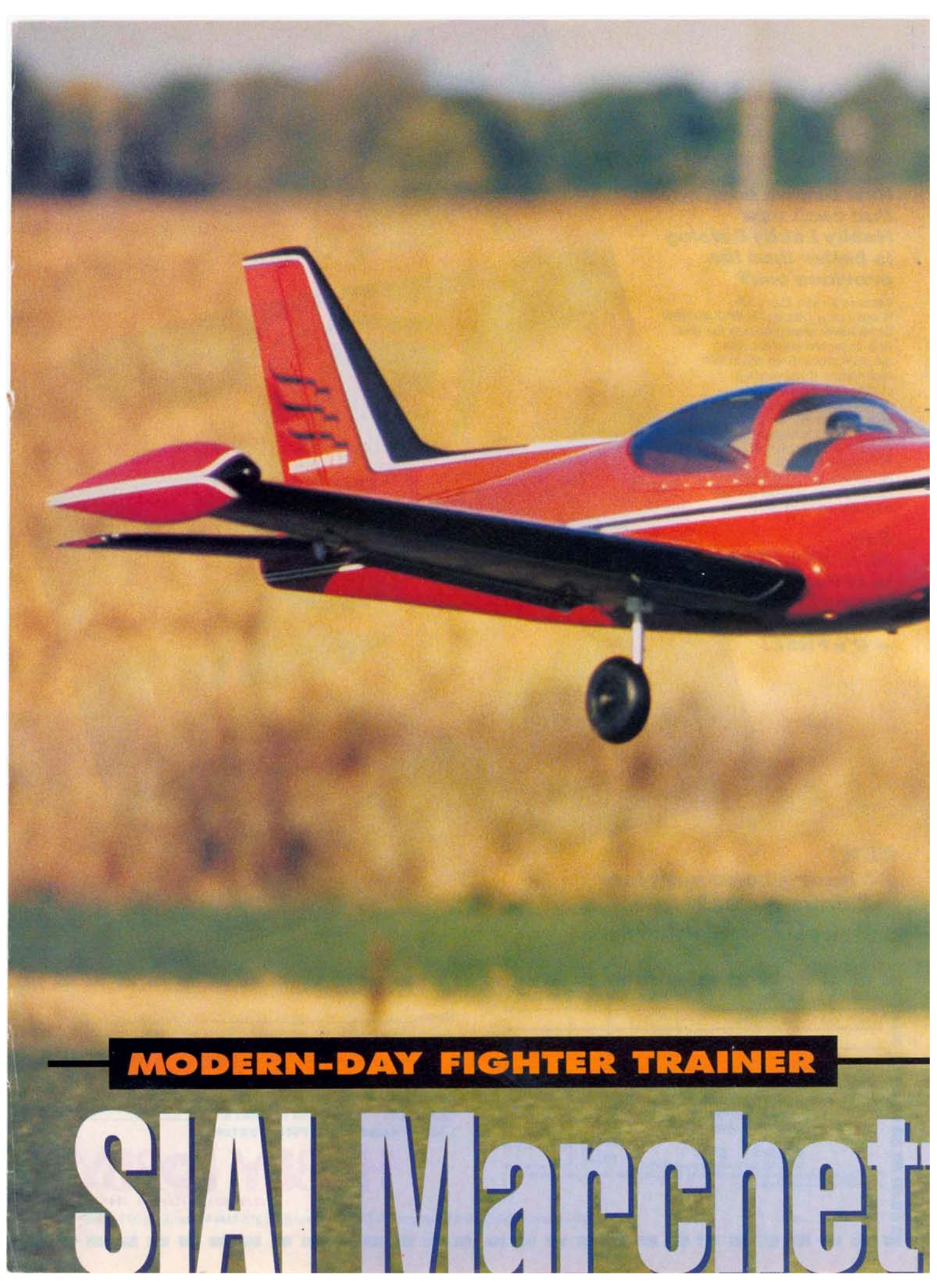
HP HELP

I have just bought a secondhand HP .40 engine from my hobby shop. The engine is in very good shape but has no muffler; the throttle body was also gummed up and didn't move. I cleaned the carb with methyl hydrate, and now it works smoothly and easily. My problem is that because this is an old engine, replacement parts are hard to come by. I have searched your advertisers index for an "HP" ad, but have found none. Do you know of anyone who would carry the HP line of engine parts like pipes, mufflers, rings, etc. for the .40? This information would be greatly appreciated.

DAVID VAN REEDE
Surrey, BC, Canada

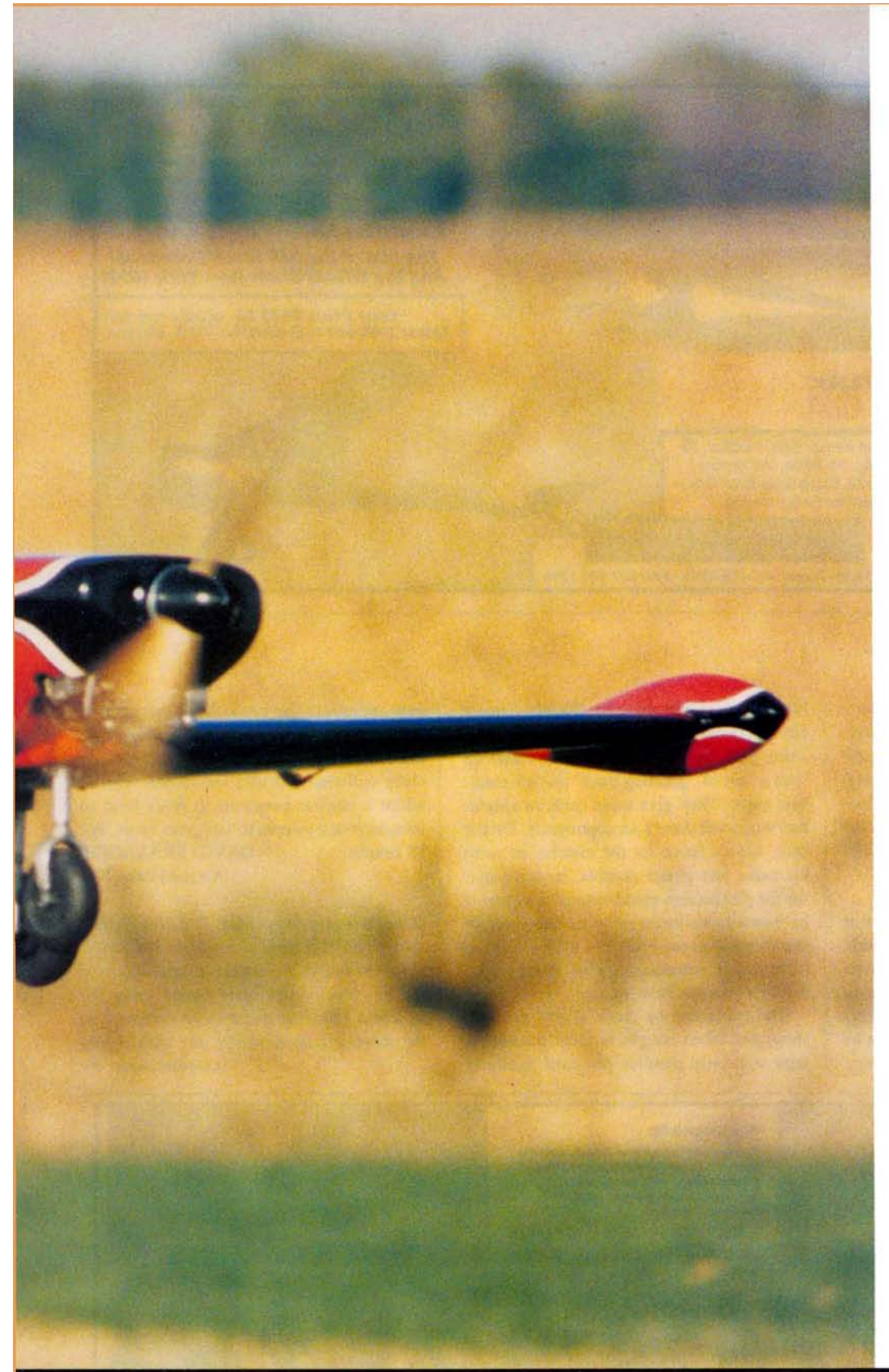
Dave, you' re in luck! RJL Industries, 1831 Business Center Dr., Duarte, CA 91010—(818) 359-0016—carries the HP .40 and .61 engines in its increasing line of older, out-

(Continued on page 68)



MODERN-DAY FIGHTER TRAINER

SIAI Marchet



MODEL AIRPLANE CONSTRUCTION NEWS MAGAZINE

by DAVID W. GOERNE

ILLUSTRATIONS BY JIM NEWMAN

Editor's note: When we first looked at David Goerne's SIAI Marchetti SF-260 design, we knew we had an important scale design that would be appreciated by many readers. Unfortunately, no detailed construction photos were available. Aviation authority and master illustrator Jim Newman solved the problem by providing a cutaway drawing of the completed model and illustrations that clarify key construction details (he also threw in a sidebar on the full-scale aircraft). Our thanks to Jim for his assistance. For further documentation on the SF-260, see the May '87 "Model Airplane News" and the August '87 "Air Progress."

DESIGNING AND building the Marchetti SF-260 has been a real joy for me. The full-size Marchetti is an outstanding aircraft. It is very maneuverable, fast and certainly a beautiful craft. I have found the model to be everything the real plane is. I have seen the Redhawks (an aerobatic team based in New Jersey) perform with their three Marchettis, and their display is awesome. If you are a lover of this plane, as I am, I suggest you keep an eye out for any air shows where they may be performing. *(Continued on page 71)*

i SF-260

SPECIFICATIONS

Type: ¼-scale fighter trainer
Wingspan: 87 inches
Length: 70.5 inches
Weight: 23 to 26 pounds
Engine: 2.6 to 3.4ci
Retracts: Likes Line

PHOTOS BY DONALD F. GOERNE

AIRWAVES

(Continued from page 62)

of-production engines. Many other engines and parts are available from RJL, including the '50s Forster .99 and the only American-made 4-stroke engines: the HP VT .49 and the VT .21. Give president Randy Linsalato a call; and he should be able to fix you up with the parts you're looking for. GY

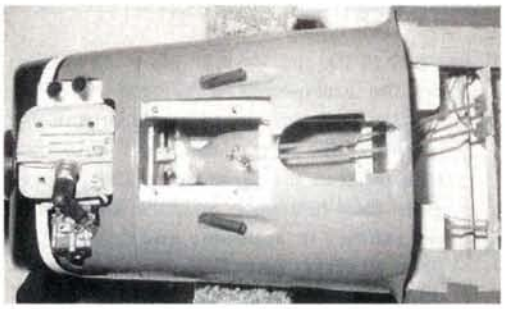
HI! MY NAME IS...

Frequently, at our flying field, we draw a number of spectators when we fly our models, and some are interested in learning more about the sport. All seem to enjoy themselves. I've talked to many of them, answered their questions and invited them to our club meetings; their interest seems very high, but few ever show up. To allow easier introductions and give a little incentive and some basic information, my club came up with a sort of "greeting card" that all members carry. They give these cards to spectators whenever there's an opportunity. On the card, there's space for the member to write his name and phone number, so it's easier for the prospective member to contact him if he wants more information on the sport or membership in our club. It's a lot easier for them to call someone they've already spoken to than some stranger.

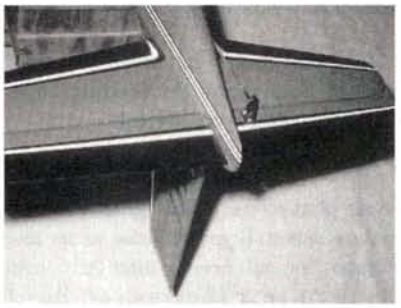
The cards can be made at any printing shop, and when bought in large quantities, they cost only pennies per card. Gaining new members far outweighs the cost of printing. I've enclosed a sample card from the Red River R/C Flyers. Perhaps other clubs will find this idea sound and wish to adopt a similar program. It does help to introduce new people to our great sport. We all benefit. DAVID BRATAGER
Grand Forks, ND

Dave, this is a great idea. It makes perfect sense. This is a great tool for all R/C model clubs to boost membership and improve public relations in their flying area. An informed public is much more receptive to the sport. It's the first step any club should

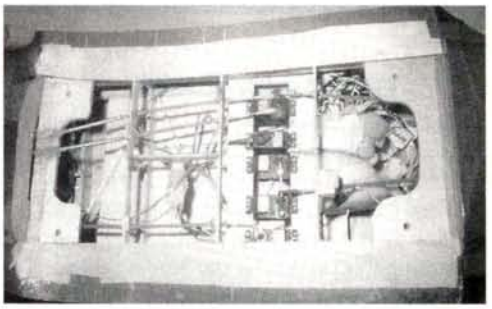
(Continued on page 86)



The nose-gear mount and the wheel well; note the exhaust pipes on either side.



The underside of the tail section.



A view of the servos, the battery and the electrical wiring.

CONSTRUCTION

I suggest you begin with the fuselage, which uses crutch construction. The crutch framework is easy to build and makes a very light, strong fuse. Begin by making the crutch on the top view. It's made out of ¼x½-inch spruce and ⅛-inch balsa. You will note that the ⅛-inch balsa crosspieces are positioned right at the formers; this makes assembly easy. Note that the notched tail end fits into former 13.

After making the crutch, build a stand for it. Put three blocks on a flat, solid board so you can move around as you build the fuselage. Make sure the board remains perfectly flat at all times. Put the formers on the crutch, and then secure the crutch to the blocks. You can now start gluing the formers into place.

Put F-1 and F-1A on last. Be sure to glue FS-1 and F-3, F-4, F-5, F-6 and F-7 at the same time. Decide early which engine you'll use so that you can put engine-mounting blind nuts in the firewall before you glue the firewall to the crutch. Note the engine thrust recommended on the plans.

Install the cockpit floor before putting F-4a into place (F-4a sits on top of the floor). When all the formers have been glued into place, start installing the stringers—all of them except those below and above the elevator. Put in as much angle bracing on the back of the firewall as you can at this time.

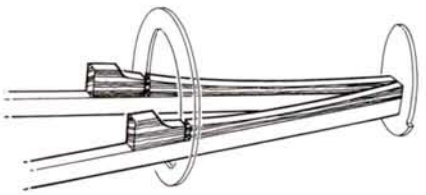


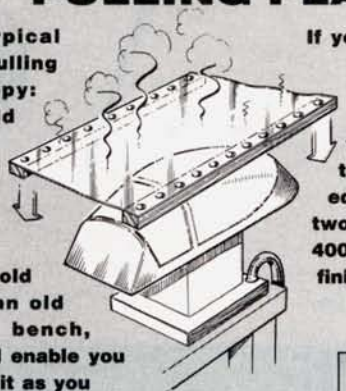
Figure 2. The stabilizer mounting pieces S-O are cut out of spruce and glued to the top edge of the crutch. Notice how the mounting pieces are cut into two so that they fit fore and aft of F-12.

You are now ready to start sheeting the fuse. Put on the largest sheets possible. Cut them close to size, soak them in ammonia, and tape them into position around the fuse. Let them dry overnight. They will be perfectly shaped. When they're dry, finish cutting them to size and glue them into place. Although you have to wait for them to dry, it makes a stronger fuse that is much easier to sand and finish. (While you are waiting for sections to dry, you can start building the elevator and rudder.)

Sheet the area above the wing to the first stringer. Fill this area in after the wing saddles have been glued into place.

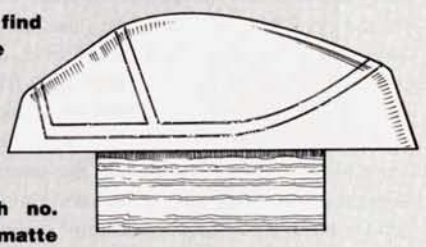
CANOPIES & COWLS

PULLING PLASTIC

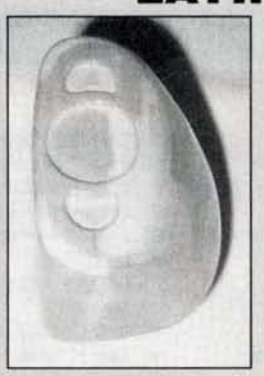


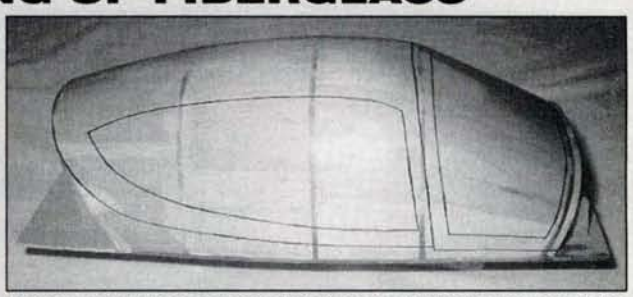
This is a typical setup for pulling your own canopy: the canopy mold is fixed to a block with plenty of clearance below it. It's much more convenient if the mold is clamped to an old chair or a low bench, because this will enable you to bear down on it as you form it. Cut a piece of 1/16-inch thick butyrate sheet—well oversize—fasten it to two stout hardwood sticks with plenty of thumbtacks, and then put it in an oven that's set at 450 degrees Fahrenheit. Watch carefully, and when it sags and becomes floppy, use mitts to take it out of the oven quickly. Then force it rapidly and firmly down over the canopy mold with all your might, keeping the pressure on while the molding cools.

If you decide to "pull" your own canopy, you'll find that the heated plastic drapes much more easily if material is added to the mold to form a plinth, which should slope at the front and rear to avoid the sharp undercuts that frequently cause wrinkles around the edges of the molding. Finish the mold with two or more coats of epoxy resin, and sand with no. 400 wet-or-dry sandpaper until it has an even, matte finish overall. Do not polish the mold.



LAYING UP FIBERGLASS





Shown are plugs for cowl and canopy that were used by author to lay up fiberglass parts. Finished fiberglass parts are also available from Fiberglass Specialties.

ELEVATOR AND RUDDER

Do as much sheeting as you can, and then put the elevator saddle S-O into place. When the elevator is finished, slide it down over former 12 and fit it into place. Note that center line of the elevator is 1/16 inch lower at the trailing edge than at the leading edge. Glue the elevator into place after fitting it properly, and finish sheeting to the elevator on the top and the bottom. When you make the rudder, shape the bottom so that it conforms properly to the fuselage structure, and glue it into place.

• **Linkages.** Now take the fuse off the crutch support frame, and turn the fuse upside-down. Install the rudder-control mechanism and your preferred linkage between the rudder and the rudder servo. When this has been completed, install the rest of the stringers and finish the sheeting. Install the nose-gear mounting blocks before you finish the sheeting under the nose end.

Note the balsa block on the bottom of the fuse between F-12 and F-13. You can now install the balsa block at the rear of the fuse—behind F-13—and shape it.

WING

Start constructing the wing. I suggest that you build a shaped saddle that will provide proper dihedral so that you'll be able to build the entire wing in one piece. If you use Likes Line* gear, follow the plans; if you use someone else's gear, you'll have to customize the installation.

Note the assembly of W-5 and the doubling of part of W-4. Use 1/4x1/2-inch spruce stringers and start construction. You'll note that flaps and ailerons are built into the wing as you go. They are sheeted to a line on the wing rib; when the wing is turned over, finish sheeting the other side. Put 1/4-inch filler blocks into the ailerons and flaps before sheeting the bottom of them. When the sheeting has been completed, the control surfaces can be sawn out by sawing ribs where the line is. Finish the control surfaces by putting 1/4-inch balsa pieces on their front edges and shaping.

You will notice that templates can be made to help shape the leading edge of wing. I found this very helpful.

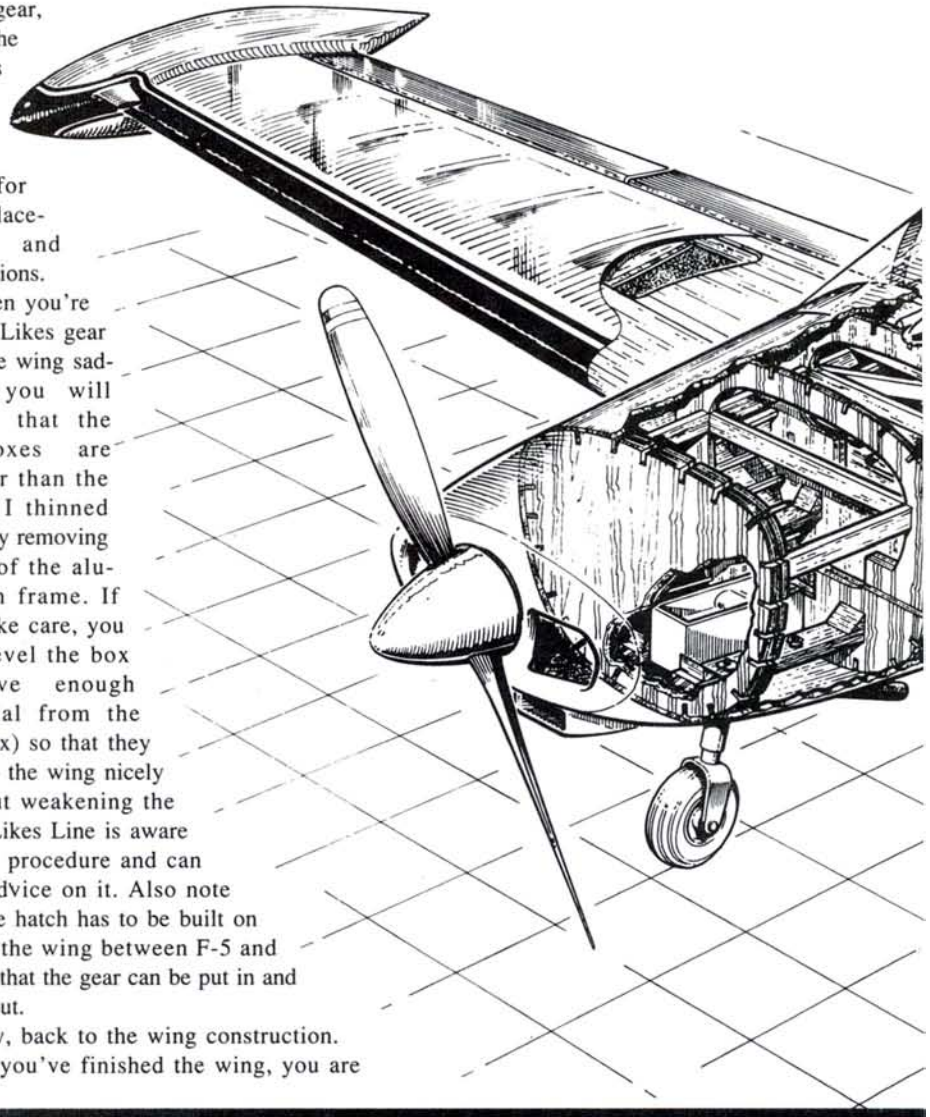
GEAR NOTES

If you plan to use Likes gear, follow the plans as shown. If you're going to use another brand, you will need to alter the construction to fit your chosen gear. Buy the gear before going too far into the construction so that you can use them to achieve a perfect fit.

If you use Likes gear, order the Series 2002, then see the plans for gear placement and dimensions.

When you're fitting Likes gear into the wing saddles, you will notice that the gearboxes are thicker than the wing. I thinned them by removing some of the aluminum frame. If you take care, you can bevel the box (remove enough material from the gearbox) so that they fit into the wing nicely without weakening the gear. Likes Line is aware of this procedure and can give advice on it. Also note that the hatch has to be built on top of the wing between F-5 and F-6 so that the gear can be put in and taken out.

Now, back to the wing construction. When you've finished the wing, you are ready to put the 1/32-inch-ply wing saddles into the fuselage and fit the wing into place. Cut 1/32-inch-ply saddles a little large on the outside of the fuse so that you'll be able to trim them to the proper size after you've glued them into place. Soak the front part of the saddles in ammonia and lay them in place to shape them. With the fuse upside-down about 2 feet off the floor, lay the saddles into place, put the wing into place, and check whether the wing in the fuse is



SIAI SF-260 INSTRUMENT PANEL (civilian)

1. Windshield
2. Instrument-panel vent
3. Magnetic compass
4. Grab handle
5. Limitations placard
6. Radio-switch panel
7. Radio stock
8. Flap-position indicator
9. Left to right: flap, battery and alternator switches
10. Magneto switch
11. Landing-gear selector switch
12. Landing-gear indicator lights (green)
13. Compass-deviation correction card
14. Fuel-pressure gauge
15. Manifold-pressure gauge
16. Tachometer
17. Air-speed indicator
18. "Cageable" attitude indicator
19. Encoding altimeter
20. Panel-lights dimmer switch
21. Carburetor air temperature
22. Left and right tank gauges
23. Left and right tip-tank gauges
24. Oil pressure
25. Oil temperature
26. Ammeter
27. Cylinder-head temperature
28. Turn coordinator
29. Gyro-heading indicator
30. Vertical-speed indicator
31. Suction (vacuum) gauge
32. Emergency locater transmitter switch
33. VOR OBS indicator
34. G meter
35. Cabin air louvers
36. Circuit breakers
37. Accessory switches

straight and true. Ensure that the elevator is level, and measure from the wingtips to the floor. When you have the wing fitted properly, glue the saddles into place. To do this, place the wing against the saddles and hold the wing in its proper position with wing bolts while the glue sets. Note that the center line on the wing is 1/8 inch lower at the trailing edge than at the leading edge.

When the glue has set with the wing in place, turn the plane over, and finish the sheeting to the wing saddles. You can now trim the saddles to size and put in the fillet. Cut the fillet to size out of balsa block, glue it into place, and sand it to shape with a round sanding block. You're now ready to put balsa block on the bottom of the wing and shape it to fit to the fuse.

TIP TANKS

I made the wingtip tanks out of balsa block. I first cut them to shape with a band saw; then I cut them into two and hollowed out the insides so that they were about 3/16 inch thick. I then glued them back together and sanded them to shape. I also made a balsa block to fit between the wingtip tank and the W-12 wing spar. I made it large enough to allow me to shape the fillet between W-12 and the wingtip

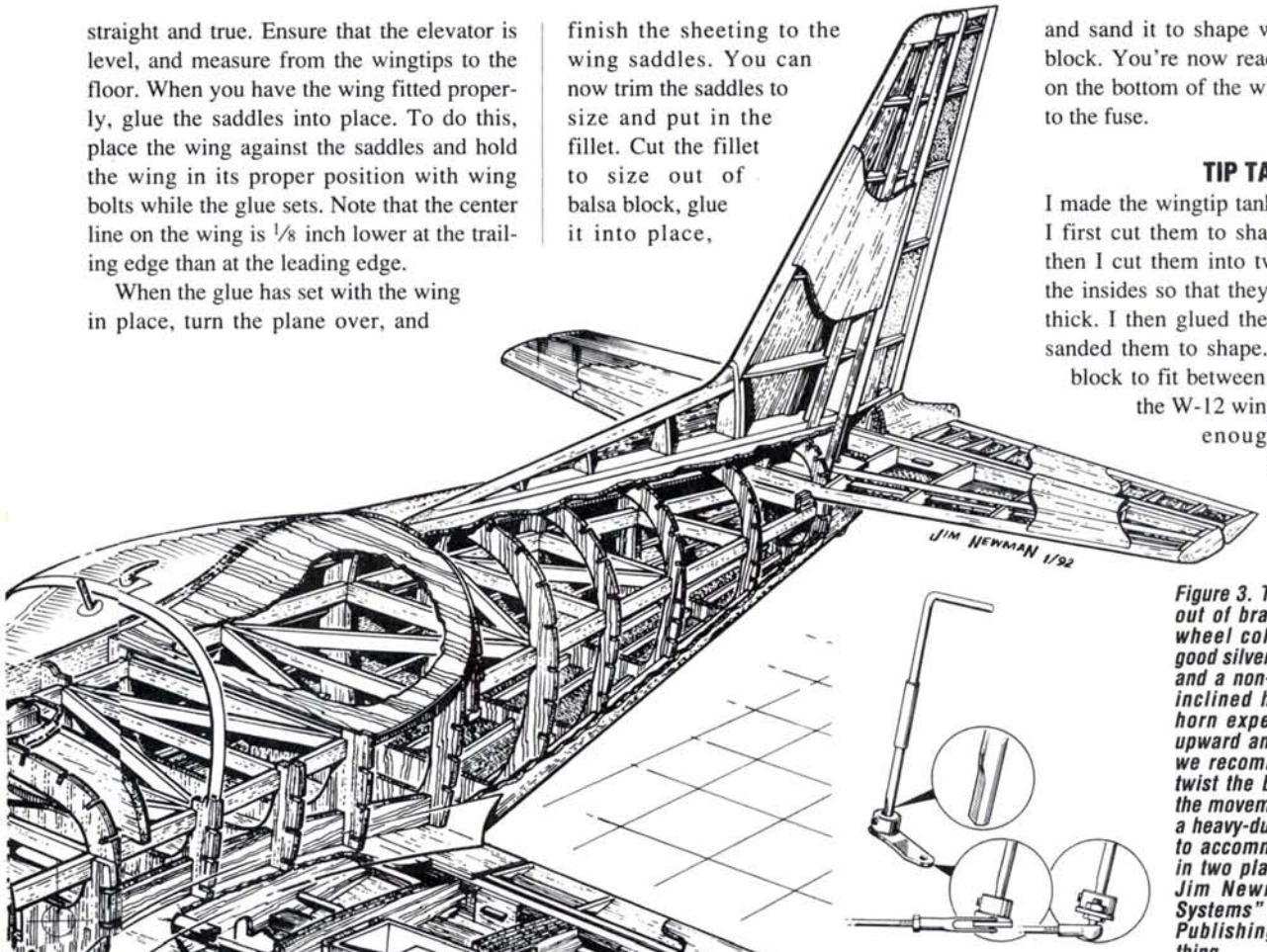
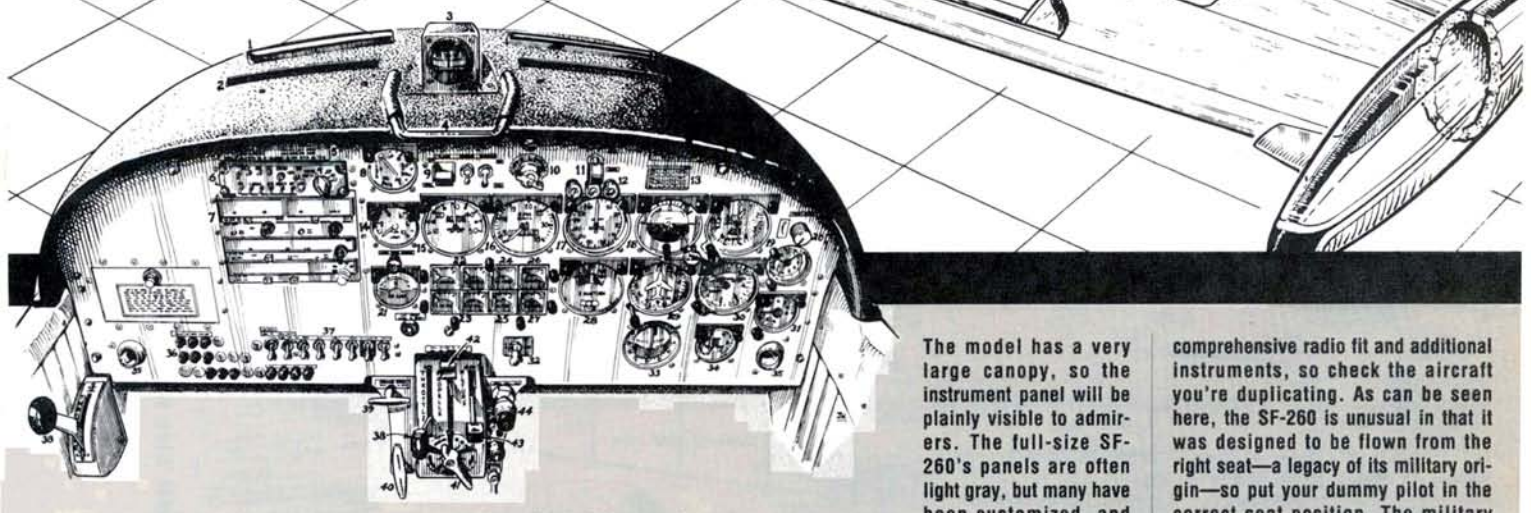
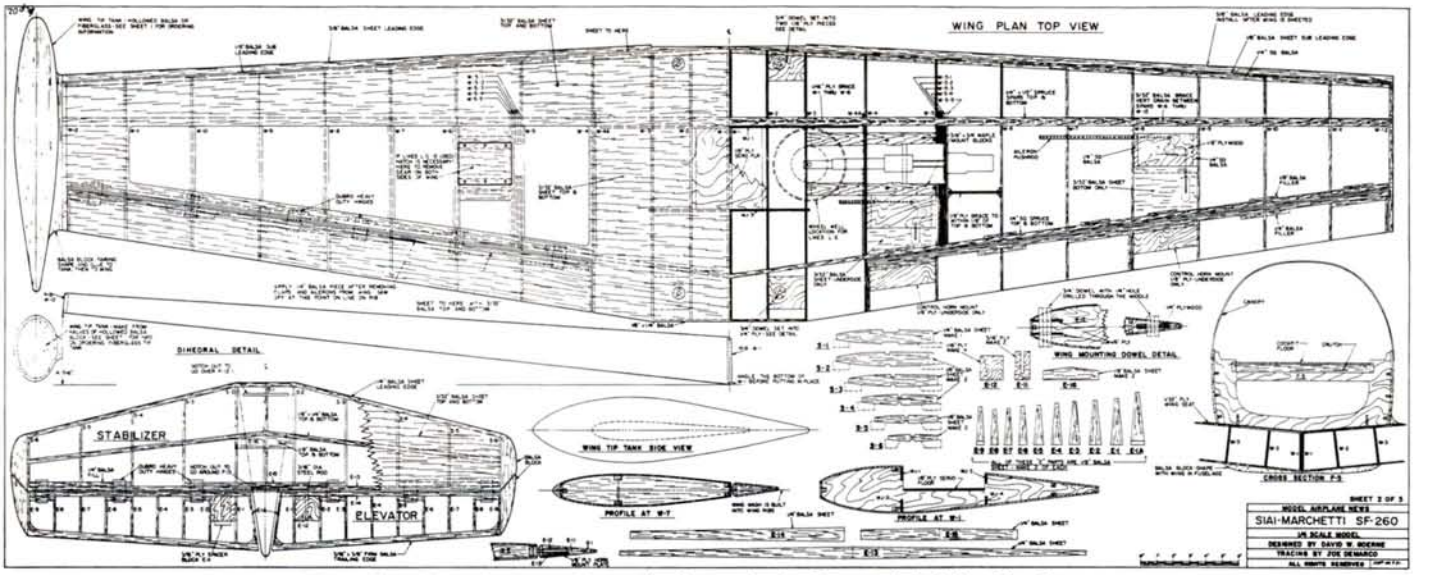


Figure 3. The rudder horn is made out of brass strip soldered to a wheel collar. Be sure to use a good silver solder, e.g., Staybrite, and a non-corrosive flux. With its inclined hinge line, the rudder horn experiences considerable upward and downward travel, so we recommend that you slightly twist the brass strip to minimize the movement. Even better, mount a heavy-duty ball joint on the horn to accommodate the movements in two planes. Pages 5 and 6 of Jim Newman's book "Control Systems" (published by Air Age Publishing) will explain everything.



38. Throttles (two)
39. Parking brake
40. Emergency canopy release
41. Fuel-tank selector
42. Propeller (pitch) control
43. Mixture control
44. Carburetor heat control

The model has a very large canopy, so the instrument panel will be plainly visible to admirers. The full-size SF-260's panels are often light gray, but many have been customized, and they can have a matte-black crackle finish. Here is the basic instrument layout. Many owners specify a more comprehensive radio fit and additional instruments, so check the aircraft you're duplicating. As can be seen here, the SF-260 is unusual in that it was designed to be flown from the right seat—a legacy of its military origin—so put your dummy pilot in the correct seat position. The military instrument panel is similar, but both sides are dominated by a massive "horizontal-situation indicator."



Two of four plans sheets are shown. Jim Newman's drawings are included on the plans.

tank. When the tank and tip-block assembly has been completed, glue it to the wing. When covering the plane, I primed and painted both wingtip tanks.

WRAPPING UP

The cowl, the canopy and the wingtip tanks are available from Fiberglass Specialties*. If, however, you prefer to make your own as I did, you can do so. I made the cowl and canopy out of fiberglass. I cut out openings for the windshield and windows, and I painted the top part to resemble tinted glass, which is found on the full-scale plane.

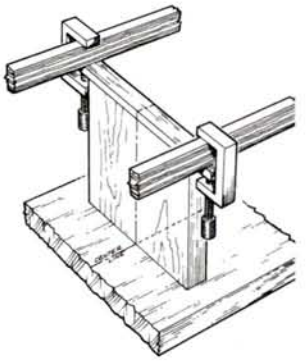


Figure 1. Here, the crutch side members are shown clamped to the assembly jig. It's essential that the jig's vertical members all be the same height; and if you have a table saw, cutting them to that height will be easy if you set the rip fence.

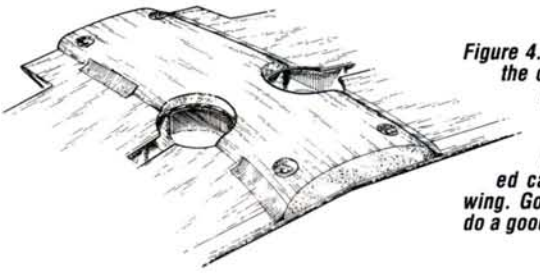


Figure 4. This view of the underside of the center section shows the belly fairing, the wheel wells and the dowel bushings for the wing attachment bolts. Notice how the block is blended carefully to the bottom of the wing. Goldberg's* Model Magic would do a good job here.

Now inspect the framed-up model. Make sure that all the holes have been filled, and complete the sanding before doing the covering. You're now ready to cover the model and attach the engine to the firewall. Depending on which engine you use, you may find the finished plane nose-heavy. Mine was, so I fastened a piece of steel to a ¼x¼-inch spruce stick and slid it into the fuselage and through to the tail section. Weight could also be embedded in the balsa block behind F-13.

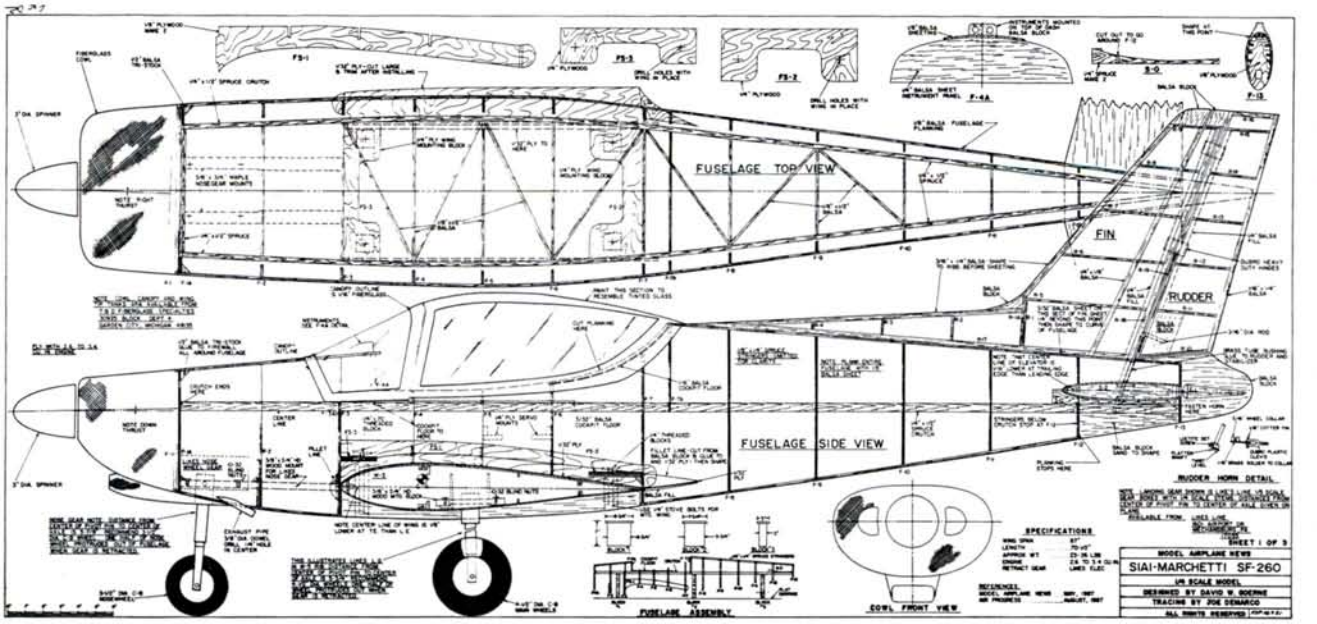
Good luck and happy flying!

**Here are the addresses of the companies mentioned in this article:*

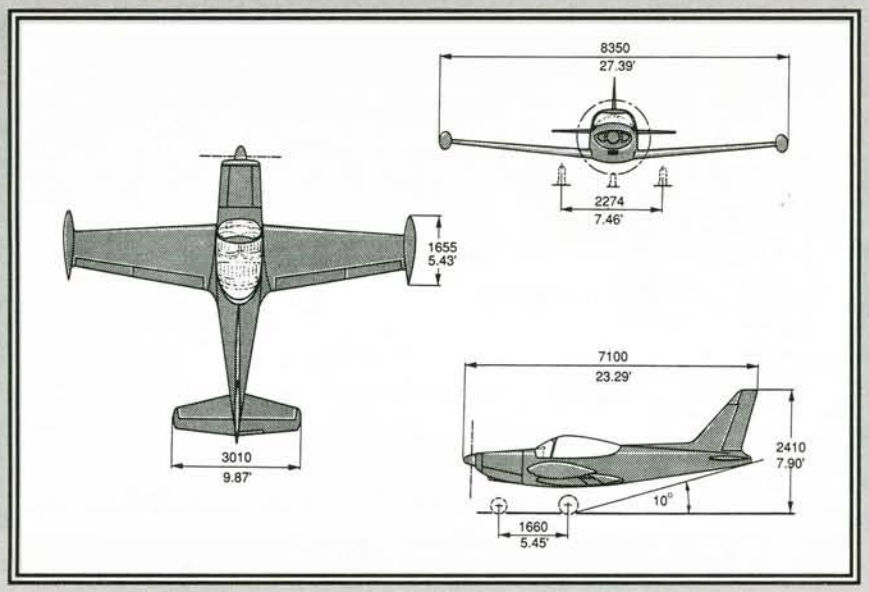
The Likes Line, *1601 Airport Dr., Mechanics-burg, PA 17055; (717) 732-0636.*

Fiberglass Specialties, *38624 Mt. Kisco Dr., Sterling Heights, MI 48310; (313) 978-2512.*

Carl Goldberg Models, *4734 West Chicago Ave., Chicago, IL 60651.*



ORDER THE FULL-SIZE PLAN...PAGE 121



THE FULL-SCALE SIAI SF-260 MARCHETTI

by JIM NEWMAN

SPECIFICATIONS
Wingspan: 27 feet, 4½ inches
Overall length: 23 feet, 3½ inches
Height: 7 feet, 11 inches
Wing area: 108.7 square feet

POWERPLANT/WEIGHT
One 260hp Lycoming 0-540-E4A5, 6-cylinder horizontally opposed, air-cooled engine; two-blade, constant-speed, Hartzell propeller; two wing tanks; two wingtip tanks. Empty weight, equipped: 1,664 pounds. Useful load: 726 pounds.

PERFORMANCE
Max speed at sea level: 187kmph; max cruising speed: 178kmph; Stall speed with flaps: 60kmph; rate of climb: 1,800 feet/minute; service ceiling: 19,000 feet; range: 805nm.

To my simple way of thinking, at least one example of the SF-260 should be preserved in a museum—not the Air and Space Museum or the EAA Museum, but a museum of fine art, for this 28-year-old design belongs with examples of other fine Italian sculpture.

Created by Dott. Ing. Stelio Frati, the SF-260 is but one of 20 designs for which he has been directly responsible. Often described as "the Ferarri of the air," the SF-260 has a somewhat gawkish look on the ground because of its inelegant trailing-link main gear, whose doors stick out sideways at an incongruous angle. Once clear of the ground and with its gear tucked out of sight, however, the lines of this aerial greyhound scream "performance" with a capital P. Give the fighter-like stick a slight sideways pressure, and the greens and blues in the windshield will neatly spin around in a neck-snapping 150 degrees per second—not recommended for the weak of stomach.

Well over 1,000 of these little thoroughbreds have been delivered in green-and-brown paint to some 27 air forces. Suitable wing hard points accommodate any hardware you care to hang on them. Under these circumstances, a flak vest and hard hat are *de rigueur*.

A P-51 requires muscle to fly. In contrast, the SF-260 is stroked through maneuvers using thumb and fingertips. According to the importers, finesse is required, not muscle. The SF-260 is suited to the high-time jock to whom instant response and a light touch are second nature.

When you climb into this machine, you are required to step over the side and slide down into the seat like entering a fine racing car. To those who undertake to build the R/C design published here, I say fly it like the real one. This is no model to be twitched around the corners or jerked through a loop. Express yourself on an azure canvas. Your peers will judge the finished picture—when the chocks are in place and the prop has stopped. ■

The author poses with his scratch-built B-17.

Judging Scale-Like Speed

BY KENT WALTERS

DYNAMIC SIMILITUDE MAY BE THE ANSWER

Editor's note: Kent Walters, a noted scale competitor and judge, makes an argument that could settle the scale speed controversy. Do you agree with his recommendation? We will publish selected letters on this subject in future "Airwaves" columns.

SCALE COMPETITORS and judges know that "scale-like speed" in aeromodeling is one of the key features considered in the evaluation of overall flight realism as well as individual maneuvers. The absence of scale-like speed is cause for downgrade by judges, as outlined under flight realism errors in the AMA rules. The problem is that there is no good definition of scale-like speed. Not surprisingly, judging opinions have differed considerably.

Imagine for the moment that a similar, general phrase were used to guide judging of static scale competition. Rather than utilize accuracy to outline and color, and marking documentation as criteria, the judges would evaluate models based upon "scale-like appearance." Documentation or pictures are obviously worth the proverbial thousand words as a static judging aid.

It's no surprise that the need to define scale speed has provoked a considerable number of articles over the last 15 years. The most recent one on record is from Don Lowe, president of the AMA. The central theme for such articles has often been what aerodynamic engineers or others similarly trained would commonly provide as the answer. Aerodynamic engineers refer to scale-speed relationships as "dynamic similitude scale speed" (see table). These are the speeds that an aircraft would display when idealistically reduced in size in every imaginable detail. Not surprisingly, they are also the speeds which our scale models also generally approximate in flight, if we have performed our job correspondingly well as builders and fliers.

Scaling speed is not simply equivalent to scaling model size on a linear basis. The familiar linear scale factors most often used to describe model size, of 1/9, 1/8, 1/7, 1/6, 1/5, 1/4 etc., would suggest disturbingly low scale speeds for us all. The correct dynamic similitude scale-speed relationship is a nonlinear factor. Specifically, it is the square root of the scale factor used in our models. Since most scale models range from 1/9 to 1/4 scale, their corresponding scale speeds should range from 1/3 to 1/2 of their full-size counterpart. Although these speeds (tempo of action) might be considered as relatively high, they are indeed very realistic expectations if you were to evaluate your model by radar (particularly with regard to its cruising speed).

Aerodynamic engineers refer to scale-speed relationships as "dynamic similitude scale speed."

It's also satisfying to know that dynamic similitude speeds are correct and natural for a scale pilot. Such a pilot would have a quicker pace or tempo in life. This includes quicker stride of walk, heartbeat rhythm, or general reaction time compared to us comparatively slow "jolly green giants." It is no wonder that flying scale aircraft is indeed a challenge to

simply keep mentally ahead of these little critters!

THE ILLUSION OF SCALE SPEED

From my experiences in competing and judging at major scale events, dynamic similitude speeds often fit well with what "many" experienced judges and competitors now describe in abstract terms as simply "capturing the illusion of scale-like speed."

With the two differing interpretations of "scale-like speed" (linear vs. square root factor), there eventually is conflict (if not anarchy) at scale events. In the past, most individuals didn't have a very good ability to estimate model air speeds. This is rapidly changing as more individuals gain access to more affordable radar systems. Although scale contests do not permit radar, the data they provide during leisure weekend fun flying has now made the question more important as to what was meant by scale-like speed. When these better speed judgment skills are acquired by those people that still believe the linear scale-speed relationships are "alive and well" for judging scale-like speed, then the stage is set for even greater problems and conflicts. It is indeed human nature for myths to die slowly, despite growing evidence that flies in the face of accepted beliefs. In either case, undefined criteria for scale-like speed gives the judges a defense for their actions. I suspect there are a great many scale competitors reading this who can relate to this dilemma. Incidentally, there is little doubt that the informed scale modeler would adopt the square root scale-speed approach (dynamic similitude) after seeing radar results for actual speeds of their models.

It is now timely to solve this growing problem by clarifying the rules to include dynamic similitude as defined above. This has been done by the Scale Masters, as implemented in 1992. This also emphasizes the theme that scale modelers build and fly miniature aircraft rather than toy airplanes. Without such a judging criteria that defines scale-like speed, the very cornerstone of flight realism in scale aeromodeling competition is on shaky ground.

In summary, more of us might live up to our ideals if we knew what they were! A scale contest deserves no less for its competitors. ■

LINEAR VS. DYNAMIC SIMILITUDE SCALE-SPEED COMPARISON TABLE

Model Scale Factor (Linear)	Dynamic Similitude Speed Factor (Sq. Root)	Examples of full-size aircraft speeds are listed at top.							
		75mph		150mph		300mph		450mph	
		Linear	(Sq.Rt.)	Linear	(Sq.Rt.)	Linear	(Sq.Rt.)	Linear	(Sq.Rt.)
1/1	1.000	75	<75>	150	<150>	300	<300>	450	<450>
1/3	0.577	25	<43>	50	<87>	100	<173>	150	<260>
1/4	0.500	19	<38>	38	<75>	75	<150>	113	<225>
1/5	0.447	15	<34>	30	<67>	60	<134>	90	<201>
1/6	0.408	13	<31>	25	<61>	50	<123>	75	<184>
1/7	0.378	11	<28>	21	<57>	43	<113>	64	<170>
1/8	0.354	9	<27>	19	<53>	38	<106>	56	<159>
1/9	0.333	8	<25>	17	<50>	33	<100>	50	<150>
1/16	0.250	5	<19>	9	<38>	19	<75>	28	<113>

Linear scale speeds are frequently below stall speeds for many models. In contrast, dynamic similitude speeds, shown between < > marks above, are the speeds aircraft are expected to achieve when idealistically reduced in size. When cruise speeds of a model significantly exceed dynamic similitude, it suggests the modeler has not adequately controlled throttle. If these speeds are below those indicated, it may suggest inadequate power or engine selection for model size and weight.

Note: large-scale "high-performance" R/C aircraft, such as those that compete at the Madera Unlimited races, are now approaching (or stimulating the development of equipment that will enable the achievement of) dynamic similitude speeds anticipated in the table. This will also favorably affect vertical maneuver realism for these large-scale models.

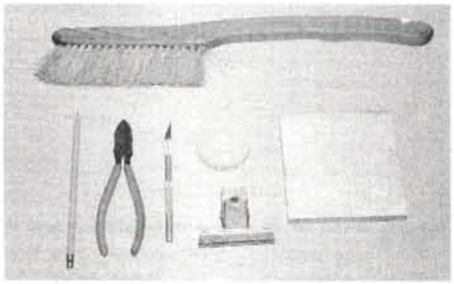
Realism for fabric-covered aircraft

RIB STITCHING SECRETS

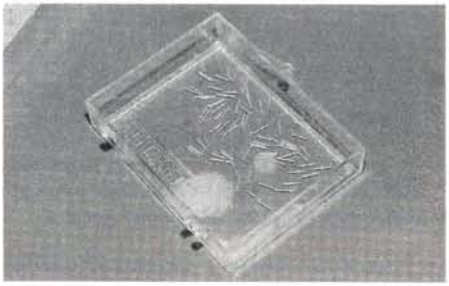
by GERRY YARRISH

THE INCREASED popularity of large-scale airplanes means that more modelers are spending time on scale finishing details. For scale planes, cloth covering has always been a step above the typical iron-on plastic finish, and on many 1/4- and 1/3-scale aircraft, rib stitching is now a standard feature; without it, the models look incomplete.

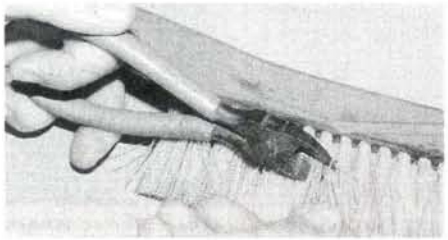
The technique shown here has always worked well for me. It doesn't take long (about five hours to detail a model such as the Balsa USA 1/3-scale Cub), it's inexpensive and, when painted, the rib stitching looks very much like the real thing. Let's do some stitching!*



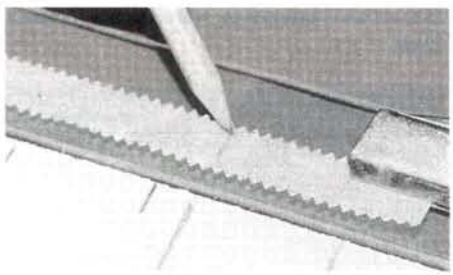
1 You'll need only a few tools and materials: an old brush with poylpropylene bristles and (from left to right) a pencil, a pair of wire cutters, a hobby knife (a no. 11 X-Acto), pinking tape (Scotch Brand 1/2-inch-wide "hair-set" tape), a spring clamp and a hard cutting block (metal or hardwood). You'll also need a medium, pointed-tip, artists' paintbrush and a primer for cloth. (I suggest Balsa USA's Magic Primer or Poly Brush.)



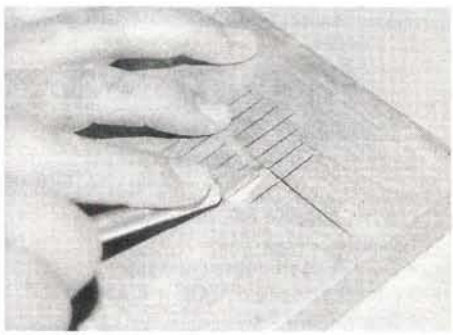
4 To rib-stitch an average model, you'll need several hundred cut bristles. For neatness, keep them in a container.



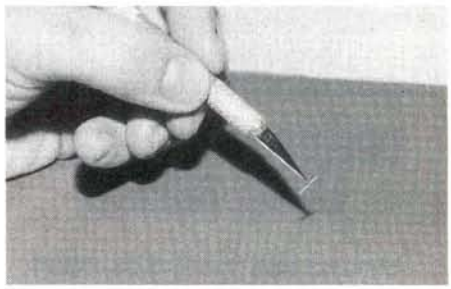
2 Use the wire cutters to cut the bristles off your old brush. (Cut as close to the brush head as possible, and keep the bristle cuttings in a small container.)



5 On the edge of a strip of paper, mark the positions of the leading edge, the trailing edge and any other sheeting edges. You'll use these marks as guides to keep the stitches neat and even. Between the leading-edge- and the trailing-edge-sheeting marks, mark the positions of your stitches. Transfer these marks and one, edge, reference mark to the pinking tape, which is laid down with the sticky side facing upward. (The clamp will prevent the tape from moving.)

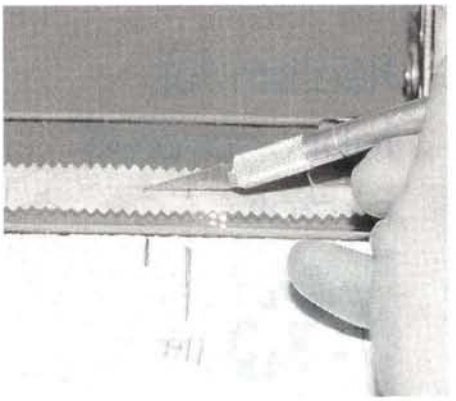


3 On a hard cutting surface (here, a block of aluminum), draw lines to mark the length you want the rib stitching to be; it will look best if the length of the stitches matches the width of the capstrips. Cut six to eight bristles to length at the same time.

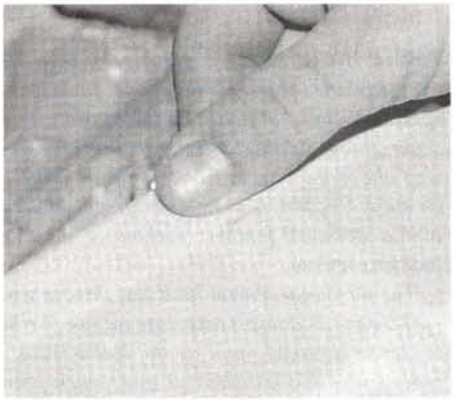


6 It's easy to maneuver the short stitch pieces with the sharp point of the hobby knife. Lightly touch a stitch with the knife edge; it will stick, and you'll be able to move it carefully to where you want it to be on the tape.

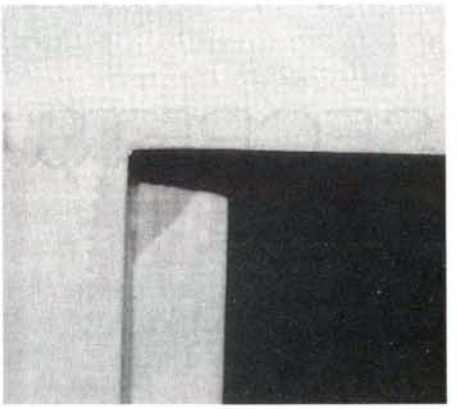
DUPLICATE RIB STITCHING



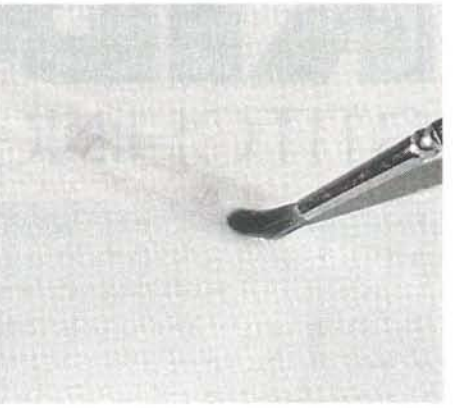
7 **Using the paper template as a guide, position the stitches on the pinking tape. On a ¼-scale model, put them about 1 inch apart; on a ⅓ scale model, about 1¼ inches is good. If you're replicating a full-size airplane, measure the distance between its rib stitches, and divide by your scale factor.**



8 **Using the edge reference mark as a guide, position the tape on top of the rib. Here, the mark is aligned with the rear edge of the leading-edge sheeting on the wing. Center the tape over the rib, and press it lightly into place. Do *not* stretch the tape when you apply it, or it will later lift off the surface.**

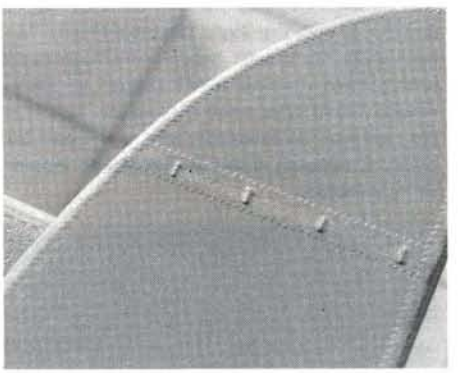


9 **For edges and other places where stitching isn't required, simply press the tape into place and smooth out any wrinkles. Here, you see the treatment for the aileron cutout area. The tape is applied with its center running along all the edges. Where two pieces of tape meet, overlap them.**



10 **When all the tape is in place, seal it into position with primer and the artists' paintbrush. As the primer dries, run a wet fingertip along the tape, and press it firmly into place.**

11 **Here's the finished wing, ready for painting. Notice that the stitches are in line and that the pieces of tape are centered over each rib.**



12 **Once painted, rib stitching looks very pleasing. The impression of scale realism is well worth the effort involved.**

**Here are the addresses of the companies mentioned in this article:*
***Balsa USA**, P.O. Box 164, Marinette, WI 54143.*
***Poly Brush;** distributed by Wick Aircraft Supply, 410 Pine St., Highland, IL 62249.*

by JEF RASKIN

OOPS! AIRPLANE FUNNIES, VOLUME I

Subject: *Prangs, collisions, crashes, smashes, bashes, goofs and shredded wings*

Source: *Propwash Video, 2873 Berman, Las Vegas NV 89109; (702) 731-5217.*

Summary: *Fun, funny, instructive, and a bit sad.*

Approximate length: *20 minutes*

You know we're called "pilots" because of our tendency to pile it here or pile it there. Most of us have a morbid fascination with destruction, so you won't be able to take your eyes off this tape even as you can't help saying "oof," as plane after plane bites the dust, kisses the tarmac, becomes creamed machine à la concrete, or just disappears into a cloud of pieces so small that a vacuum cleaner is needed to take the remains home.

I don't know how they got some of these shots. A plane takes off and promptly flies into a 20-foot-tall Saguaro cactus. A biplane goes under a rope barrier—almost—and emerges a monoplane. This is an abject lesson in how tail-heaviness leads to automatic re-kitting, why you shouldn't rig your ailerons backwards, how not to handle a tail dragger, and it shows that the pilot whose airplane has no flaws and who always lands smoothly is guaranteed to have a midair collision. Murphy's law rules supreme.

Most of the planes used to be scale WW II types: we see a P-38 land, and both its engines fall off simultaneously. What's left noses up and stalls, of course. A biplane's wings collapse in midair; we watch the endless, spiral death-dive into the desert. Innumerable landing gear are erased from planes by terra firma. We learn that the bigger they are, the harder they fall and the more dramatic their demise.

This tape is a collection from many sources, so don't expect professional video for every shot, but the producers have done a fine job with the material; they even replay some of the more interesting crashes in slow motion. Though fun to watch at home, I think this would be a great club movie, perhaps run in conjunction with a "best crashes of the year" awards ceremony. You can tell the honorees that with a bit more practice, they could do some really spectacular crashes and get into the movies.

ASTRO CHAMPS

Subject: *An all-electric medley of electric flying*

Source: *AstroFlight Inc., 13311 Beach Ave., Marina del Rey, CA 90292; (310) 821-6242.*

Summary: *Interesting electric competition, especially the payload contest.*

List price: *$10.95*

Approximate length: *30 minutes*

The 1992 Astro Champs, sponsored by AstroFlite Inc., included scale, pattern, pylon racing and a new payload competition for electric-powered R/C models. It was all interesting, but the best coverage and the most exciting event for this reviewer to watch was the payload competition. The planes had a span and area limit, and the battery pack and motor were the same for all contestants. The contest was simple: take off and fly under control for one minute with as much weight as you could. The weights were placed in a compartment whose size was also specified in the rules.

The planes built for the task were quite different from one another. One was a four-wheel cabin-style plane, another had polyhedral, while a third had long, thin glider-like wings and winglets. I won't spoil the fun by telling you which came out the winner, but the amount of weight it could carry was staggering. The planes weighed in at

(continued on page 97)

AIRWAVES

(Continued from page 68)

take to improve their chances of getting and keeping a flying site. You guys are on the ball; I hope other clubs will take your lead. I'll suggest it at the next meeting of my R/C model club. GY

PROPPING A 3.25

Your January '93 issue was very welcome in my home because I had an O.S. .25 engine just waiting to be put into a new model. I started building the Extra 3.25 from your pull-out plan right away. I found all the parts I cut out fit perfectly and the model was easy to build. The only thing left out of the great article was information on which prop to use. Which size do you recommend for my O.S. .25-powered Extra 3.25. (I live at sea level.) FEDERICO CAMPOS
Guayaquil, Ecuador

Federico, for a clean design such as the Extra 3.25, an O.S. .25 would be happy with a 9x5 or a 9x6 propeller. The model is designed to be an aerobatic sport flier, so you need enough power to fly it accordingly. Engines are designed to give their max power output at a certain rpm range, which is usually given in the manufacturer's specs. A prop that's too big or has too great a pitch will bring the engine's rpm below that range and will strain the engine. The opposite is true of a prop that's too small or doesn't have enough pitch: the engine will over-rev, and the power output will drop off. Experimentation is the key to selecting the best engine/prop combination, but I think that these two sizes are close to what you want. GY

TO COUNTER OR NOT TO COUNTER?

I'm in the final stages of constructing a P-38 kit from Royal Products Corp. I have modified two Enya 60 engines with Perry carburetors. Not wishing to deal with the torque generated by two engines, I'd like one engine to rotate clockwise and one counter-

(Continued on page 97)

MODEL AIRPLANE NEWS MAGAZINE
FIELD & BENCH REVIEW

HIROBO LAMA

by A.E. STANLEY

SPECIFICATIONS

Model name: Hirobo Lama
Length: 48.81 inches
Rotor diameter: 47.24 inches
Tail-rotor diameter: 8.46 inches
Weight: 7.5 pounds (ready to fly)
Gear ratio: 9.625:1:5.5
Engine range: .28 to .35
Engine used: Enya SS .35 with TN carburetor
No. of channels req'd: 5 (throttle, collective pitch, cyclic control and tail rotor)
Price: $699 (optional cockpit set part no. 0402342—$36.50; exterior accessory set part no. 0402345—$33.98)
Features: the Lama has a scale truss construction tail boom with a shaft drive tail-rotor system, a factory-assembled rotor head and tail gearbox, plastic side frames with molded-in fan shroud and bearing blocks, a one-way bearing in the starter system, a metal-plate engine mount and an autorotation hub. Some of the parts for the Lama and the Shuttle are interchangeable. The Lama can use the MRB-III (three-blade) rotor head, which is available separately.

Hits
- Stable flight characteristics
- Scale construction and appearance (optional interior and exterior scale accessories available)
- Assembled rotor head and tail-rotor gearbox

Misses
- none

THE LAMA IS one of several helicopters recently released by Hirobo* that are aimed at the scale modeler. Modeled after the very popular SA-315 B helicopter, the Lama is produced by Aerospatiale and flown extensively in Europe and the United States.

THE KIT

Like all Hirobo products, the Lama is very well packed. The components are separated into bags and correspond to the steps in the instruction manual. The parts are separated into three main sections and packed in boxes to ensure that the contents are protected.

The rotor head comes assembled and requires a minimum amount of work to install. I run the rotor at about 1,600rpm, and this greatly improves the flight control "feel" of the Lama.

Altech—Hirobo's U.S. distributor—has included more information related to engine set-up and trimming, and that's a welcome addition to an already impressive kit. With all the parts separated on the bench and clearly marked, let's get started.

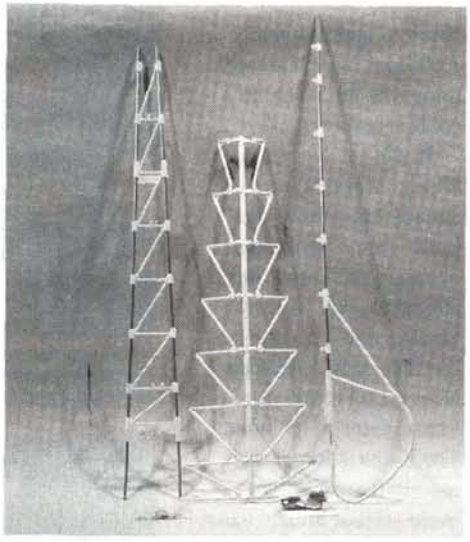
The parts for the Lama kit are neatly bagged and well marked. The instructions are easy to follow, thanks to Altech's additions to the Japanese guide.

CONSTRUCTION

First, read the directions and check the parts list against the contents. Any missing parts that are discovered now could prevent headaches later. The first page of the instructions takes the builder through all the hardware and explains the codes used throughout the manual. The next two pages go over what is needed to assemble and fly this helicopter.

Assemble the rotor head first. The basic head is over-swung and includes the yoke, the feathering spindle and the blade holders, which are assembled at the factory. Almost all of the head assembly is made of lightweight plastic. To complete this assembly, install the flybar, the paddles, the stabilizer control arms and the mixing arms. Then install the washout system and the swashplate. The detailed drawings of each part simplify this assembly. (These exploded views appear throughout the manual.) Also on each page is a metric rule, which is very useful when identifying hardware.

The tail assembly is easy because the entire gearbox comes assembled. The only parts needed to complete the tail box are the tail-rotor blades. The tail unit includes thrust bearings, but it doesn't include rotation bearings. (I'd prefer to use both types of bearing, but if only one is to be used, I agree with the selection of the thrust bearings.) The operation of the pitch plate is very smooth and precise.



This is how the tail-boom truss comes out of the box. If you want to paint it, do it now, before you assemble the unit.

The tail-boom truss is unlike any other on the market. Instead of the usual length of aluminum tube, the Lama uses the scale-type truss tail. Because I wanted my paint scheme to match that of the real Lama (the one used for rescue in the Swiss Alps), I painted the truss pieces before assembly. Once the paint had dried, I proceeded to build the truss section. A supplement to the instructions recommends that you replace the supplied self-tapping screws with 2mm nuts and bolts—a wise move, since I've been told that the self-tapping screws can cause the plastic to crack.

Once the tail box has been clamped to the tail truss with the tail holder, it's only a matter of installing the drive wire and sliding the tail box into the tail holder to complete this section. A supply of "zip ties" is included to secure the tail pipe to the truss. Although this may not be the most attractive means of attaching the drive system, it works very well.

The blades require the usual weighting, balancing and covering. When you've finished with the blades, assemble the servo trays and the fuel tank. Anyone who is familiar with the Hirobo Shuttle will recognize the servo layout used in the Lama. The fuel tank, which is unique to the Lama, is clamped in place when the main frames are assembled.

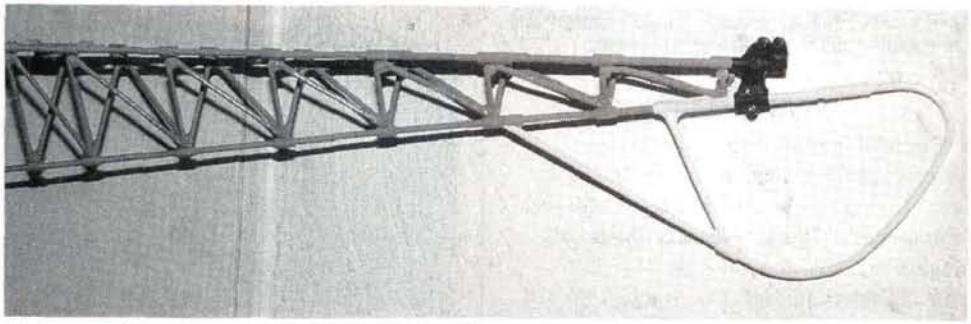
The Lama's main frames are well-designed. The fan shroud is molded into the main frames. The frames also include molded-in bearing blocks for the starter shaft, the tail drive and the main shaft. This machine uses a one-way bearing in the start system, which is much easier to use than the belt start commonly used on the Shuttle.

The tail-rotor gearbox comes already assembled. All you have to do is mount the rotor blades. The unit operates smoothly and precisely.

POWERPLANT

This review kit came with an Enya* .35. Everything needed to complete the engine section (including a muffler) comes with the kit. Also included are an extension for the needle valve and a special throttle lever—nice touches that save the builder from scrounging for the right parts.

Using a metal plate, attach the engine assembly to the main frames. The plate and the engine are inserted through the bottom of the main frames. By leaving an opening in the main frames, the engine can be installed (and removed) without taking the muffler or the needle valve off. (I found this useful when the prop nut became loose.) When the engine is in place, install the assembled main gear, the autorotation hub and the main shaft.



To improve its scale appearance, I painted the tail-truss structure and the tail skid to duplicate a Swiss rescue chopper. The tail-rotor gearbox slides into the end of the truss boom and has a flat side, which prevents the unit from rotating.

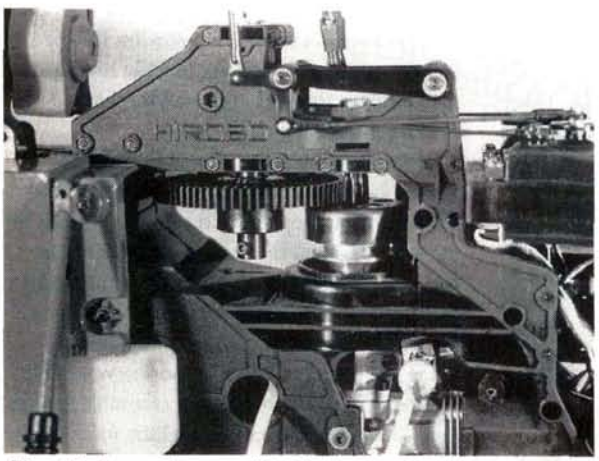
CONTROLS AND FINAL SETUP

Control functions are next on the list. The configuration of the control rods is similar to that of the Shuttle, and it has been proven to work well. The servos are mounted on molded plastic trays, which are attached to the side frames. Nothing out of the ordinary here; there's plenty of room for the gyro and the battery pack in the canopy.

To complete the machine, install the radio and the gyro. I use a Futaba* Super 7 with a 1,200mAh receiver battery pack and a Futaba 153 BB gyro. The Lama has a mounting plate for the radio switch and the gyro switch. Also shown in the instructions is a hole for mounting the "one-touch booster cord" or "remote glow" as we Americans call it.

Install the landing gear, the tail truss and the rear frame panels. The installation of the tail truss incorporates the side panels as both body pieces and a frame extension—a nice piece of engineering.

The rest of the construction is basically cosmetic. The side panels are attached, followed by the skid braces and the dummy engine. Assemble and install the cabin. In keeping with the overall scale motif, I purchased the optional cabin set (part no. 0402-342) and the optional exterior set (part no. 0402-345), which greatly enhance the appearance of the machine.



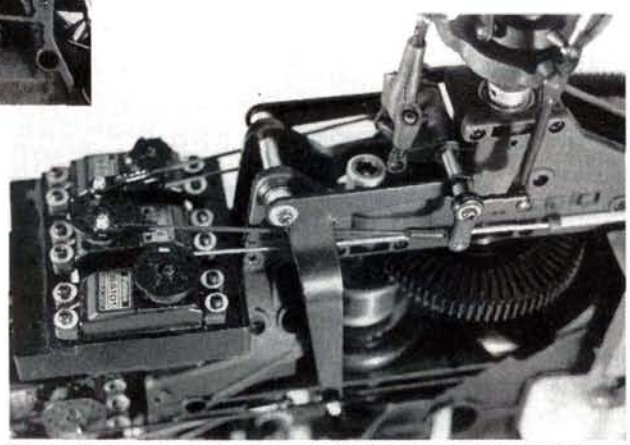
The side frames have molded-in bearing blocks and a molded-in fan shroud. The autorotation hub and engine clutch can also be seen here.

PERFORMANCE

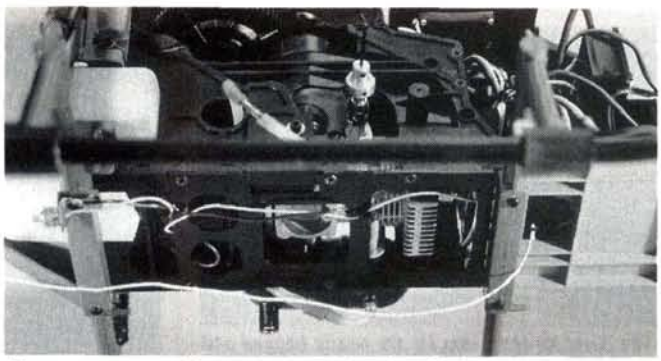
The initial running of the machine was smooth, and it responded well to inputs. It was, however, a bit underpowered, although this condition improved as I broke-in the engine and leaned it out a bit. I use 12.5-percent-nitro heli fuel. For an initial setup, I used 8 degrees of top-end collective pitch, and I used -4 degrees of pitch on the low end. I like to get my models down in a hurry! I also increased the head speed to approximately 1,600rpm, which greatly improved the machine's control feel.

If you've ever flown a Hirobo Shuttle, you already know how the Lama flies. Owing to its heritage, the Lama flies almost exactly like the Shuttle, and it's very stable. The only difference I have found is how the Lama reacts in the wind. The Lama is larger than the Shuttle, and it has more surface area to catch wind. It weathervanes a little more but is not harder to control. All in all, this bird is very easy to fly, and it hasn't displayed any bad flight characteristics.

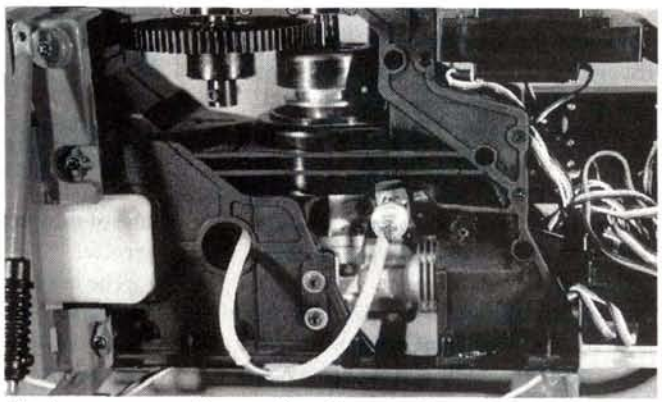
I would prefer a .46 rather than a .30 engine for this bird. Although the Enya .35 I installed runs well and is adequate for scale flight performance, I prefer a little extra power. Remember, the Lama is a scale model helicopter and is not designed for unlimited aerobatics. Though it will do its share of aggressive maneuvers, it should be flown in a scale flight envelope. If you plan to enter scale competitions, check the rules before you use a .46 engine. The Lama is listed as a .30 machine and, in some cases, only engines in the .30 range are accepted.



The servo placement and the control linkages are similar to those of the Shuttle series. Just visible here is the one-way bearing starter shaft. This is much better than the belt-start system on the Shuttle.



Here, you can see the engine-mounting plate that bolts up between the two main frames. You can also see the remote glow-plug driver and its wires attached to the aft landing skid bracket.



The Lama comes with a needle-valve extension, which makes engine adjustments much easier. Also, shown is the aft-mounted fuel tank in place between the main frames.

PHOTOS BY A.E. STANLEY

CONCLUSION

Hirobo's Lama is truly a winner. If you're interested in scale competition, or you want to fly a machine that looks like the real thing, this helicopter is perfect. This machine is a contender, and it will undoubtedly be winning contests around the country. (I met Jim Davey at the Northeast Helifest last summer and watched him fly his Lama. Jim took that machine to the '92 Schluter Cup and took top honors in Scale.)

The Lama looks and flies like the real thing right out of the box. All that's needed to complete the scale appearance is the optional cockpit and exterior accessories, and you're ready to compete! Happy flying!

**Here are the addresses of the companies mentioned in this article:*
Hirobo; *distributed by Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391.*
Enya; *distributed by Altech Marketing.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*

ROTARY-WING ROUNDUP

NEW HELI PRODUCTS

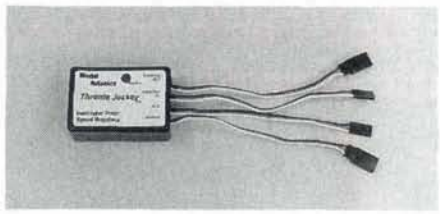
O.S. ENGINES
O.S. .61 SX-H & RX-H

These new O.S. .61 helicopter engines have a unique carburetor that enhances hovering power. Unlike 2-needle carburetors, which affect only high- and low-end operation, the new 3-needle design also includes a setting for mid-range adjustment. These engines allow fliers to make extremely fine, accurate adjustments to all three ranges and obtain maximum overall performance. To reduce crankcase-to-carb heat transfer, a plastic ring insulates the carb from the crankcase. Both engines also provide extremely smooth, powerful operation without modifications, or they can be used with a tuned pipe. Both the rear- and side-exhaust versions are ringed; this means lower repair and rebuilding costs and greater overall consistency, durability and ease of operation. Specifications: size–.61; weight–21.2 ounces; fuel–glow; output—2.1hp at 16,000rpm.

Part nos. OSMG1963 (SX-H); OSMG1970 (RX-H).

Prices: $369.05; $369.95.

O.S. Engines; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-6300.



MINIATURE AIRCRAFT USA
Throttle Jockey

The Throttle Jockey is a dual-speed, constant rotor-speed regulator that regulates rotor speed in all active flight situations. The Throttle Jockey is able to update approximately 10 times faster than other speed controllers. Up to eight selectable speed ranges from approximately 1,200rpm to 1,850rpm are available from each range.

Part nos. 4578F (Futaba radios only); 4578J (JR radios only).

Price: $139.95 (magnetic shaft adapter is sold separately).

Miniature Aircraft USA, 2324 N. Orange Blossom Tr., Orlando, FL 32804; (407) 422-1531.

A.E. STANLEY ENTERPRISES
Fiberglass-Covered Rotor Blades

These fiberglass-covered wooden blades are matched by weight and then balanced, and their CGs are correct. To ensure a uniform covering, the fiberglass is applied using a vacu-bagging technique. Each blade is then painted and given three coats of high-gloss clear. You can order stock blades or have them made to your specifications, i.e., length, weight and color.

Price: $80

A.E. Stanley Enterprises, 686 Violet Rd., Warminster, PA 18974; phone/fax (215) 675-0155.

AIRWAVES

(Continued from page 86)

clockwise. To date, no one has been able to tell me how to do this. Is it possible?

ERNEST C. ELLIOT
Sparta, TN

Yes, it is possible. You didn't say which Enya 60 you have; Enya has made quite a few models. First, call Altech Marketing's consumer-service line at (908) 248-8738, and ask for Fred Fischer. Depending on which .60 you own, Altech can probably make a reverse-rotation crankshaft for it. Basically, this clockwise-rotating crankshaft (viewed from the front) has an intake port that's a "mirror image" of the normal counterclockwise-rotating crankshaft. See if Altech can get one for your engine.

Some of the Enya .60s have a separate front housing, and I've heard that you can rotate the housing 90 degrees thereby changing the intake timing. I've never tried this, so—naturally—I'm skeptical. I have, however, owned several twins in my modeling "career" (one was a Royal B-25 that lived through four flying seasons), but I've never had counter-rotating props, nor have I felt there was an undue torque problem. I think people make more of it than they should.

There's another solution: make your P-38 a British version. Lockheed supplied the Brits with Lightnings that didn't have counter-rotating props! Only P-38s used by the USAF used counter-rotating props. CC

VIDEO VIEWS

(Continued from page 85)

about 3 or 4 pounds, including R/C, motor and battery pack. Yet the winner carried 10 pounds, 4 ounces of lead aloft. That's a total of over 14 pounds—over three times the empty weight—flying smoothly and under complete control on an 05 electric motor.

I don't want to slight the other events. The ducted-fan Swallow was fun to watch. A four-engine (multiple engines are so easy with electrics!) B-24 won the scale competition, and a twin ducted fan British Meteor jet was a joy to behold. I was amazed as an F3E competition electric sailplane performed creditable aerobatics, including a very nice square loop—a power maneuver if ever there was one.

This is not your polished video production, and the planes become unseeable dots from time to time, but these minor flaws will soon fade from your memory while the thrill of the competition will remain. This tape is a must-have for the electric plane buff or electric-oriented club. ■

CENTER ON LIFT

MICHAEL LACHOWSKI

R/C ROCKET GLIDERS

I'LL DEDICATE MOST of this month's column to a type of soaring you've probably never heard of—S8e R/C rocket gliding. Anyone who soars over flat land has to adopt some type of launching scheme, and rockets offer one possibility. I also have a tip for setting up a good, lightweight control system for small, hand-launch gliders. And finally, for those who can never get enough information on soaring, I'll tell you how you can acquire proceedings from the National Sailplane Symposium.

Ben Roberto prepares to launch his S8e model—

S8e R/C ROCKET GLIDERS

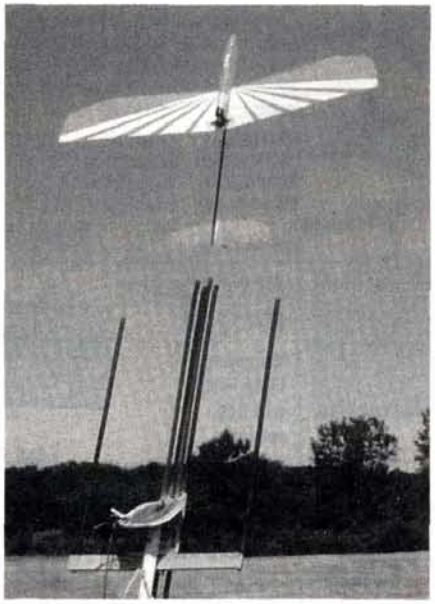
Most fliers launch sailplanes with a winch, a high-start, or an electric motor. Other pilots use rocket motors—that's right, rocket motors. You've probably seen ads or reviews for the AeroTech* Phoenix™ and the Estes* Astro Blaster™. There are also official rocket glider competitions known as FAI Class S8e R/C Rocket Glider Duration. Through the wonders of computer networks, I met Kevin McKiou, who provided the pictures for this column and offered some insight into S8e flying in the U.S.

Several of the top S8e competitors in the world are in the Chicago area. From left: George Riebesehl (1992 World Silver Medalist; USA), Lu Droppa (1992 S8e World Champion; Czechoslovakia) and Ben Roberto (1992 S8e Seventh place; USA).

What, exactly, is S8e Rocket Glider Duration? The "S8e" refers to a section of FAI space modeling R/C glider competition. It's similar to AMA Thermal Duration. The only real difference is in the launch: instead of a winch, rocket power launches the glider, and the power of the motor has a specified limit. A competition motor is an E6 that produces a 40 newton-seconds impulse. This impulse will cause a typical competition motor to loft the model to about 1,000 feet and to reach launch velocities of 120 to 150 feet per second. Duration for competition is 6 minutes, and the rules are evolving to require a runway-type landing. How big are these rocket gliders? A well-designed glider weighs about 8 ounces; its wing area is 200 square inches and its wingspan, less than 4 feet. The motor's power limit dictates the small size and the low weight.

Kevin has provided a three-view of one of his designs to share with you. The glider is smaller than a typical hand-launch glider, and what a design challenge! It's lightweight, yet strong enough to be launched by rocket power. The glider must have low drag during launch but still soar efficiently with a very low Reynolds number during its glide.

The construction of Kevin's KnightStar V R/CRG is similar to an HLG. It has balsa-sheeted foam wings and a simple



Kevin McKiou's S8e model, KnightStar IV, clears the launch tower during a practice session in Naperville, IL.

LIGHTWEIGHT PUSHRODS

Hand-launch gliders are fun to build and fly. If you've avoided them because you're afraid that you won't be able to throw them, consider using a high-start, a winch, or a catapult. You'll develop a much greater sensitivity to the local air conditions with a hand-launch glider because it's very responsive to the lift conditions near the ground.

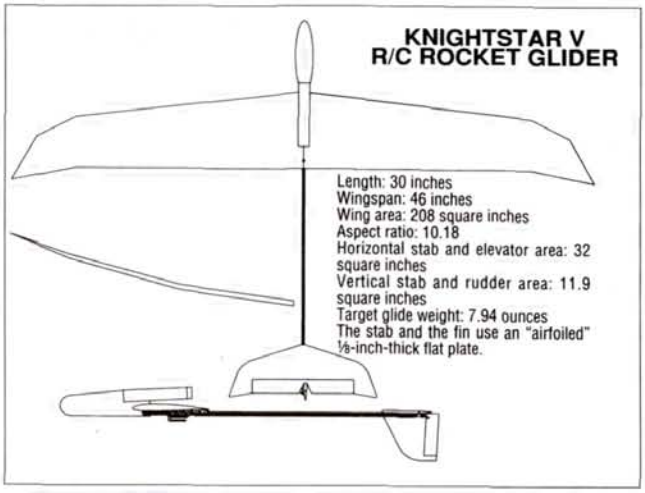
One goal in building an HLG is to keep it light, although this presents some challenges for the control system. You'll need pushrods to actuate the rudder and the elevator. You may use lighter pushrod cables, but they pose one problem: they're great for pulling, but horrible for pushing the control surfaces. Whenever I've used these cables, the control has been sloppy and unacceptable.

To solve this problem, switch to solid music-wire pushrods. You can use the same pushrod sleeve, but substitute 1/32-inch music wire. These pushrods are very positive when you push the control horn. In addition, it's easy to bend the end that's attached to the control horn; this eliminates the need for a clevis.

National Sailplane Symposium Proceedings

Al Scidmore dropped me a note about the proceedings from the recent National Sailplane Symposium. The proceedings and presentations are published for those who can't attend, and although the 1992 proceedings haven't been printed yet, those from previous years are available. Al has taken charge of the mailing list and has copies of eight proceedings, starting from 1983. The prices have been reduced, and there are special package deals for all eight and for the latest four. I'm sure you'll enjoy the fascinating material from top sailplane designers and fliers.

Prices: 1983—$7, 1984—$7, 1985—$8, 1986—$8, 1987—$9, 1988—$9, 1989—$10, 1992—$12. (Add $3 shipping per copy; $ 6 outside the U.S.). All eight proceedings—$75 ($80 outside the U.S.). The latest four proceedings—$45 ($50 outside the U.S.). For orders or information, contact Al Scidmore, 5013 Dorsett Dr. Madison, WI 53711.

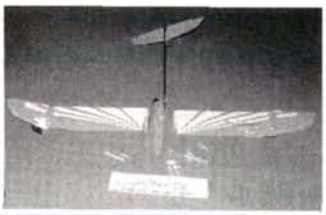


pod-and-boom fuselage, and the motor-tube position is just above the wing. To minimize pitch changes during launches, the thrust line must be close to the CG. For competition flying, Kevin uses AeroTech E6 motors, and for practice flying, less expensive black power Estes D11s or D12s. Because these motors ooze a lot of gunk that can really mess up the tail. The rudder is on the bottom of the fuselage and out of the way of the rocket exhaust.

Current designs use fast airfoils similar to those on F3B designs. These thin airfoils have low camber that maximizes launch height and still provides thermalling performance. Choices include the SD7003, the RG14 and the RG15. The KnightStar V uses the BP2r designed by AeroTech's Bob Parks, who also designed the Phoenix sport rocket glider.

For launching, Kevin uses standard 12V rocket equipment, an interlock key and a launch button with extra cord so that he can see if the model starts to pitch back over his head during launch. Kevin uses a foot switch so both hands can hold the transmitter and control the model during launch.

The photos show a typical launching pad with four parallel rods that guide the fuselage at the start of the launch. The fuselage slides cleanly through the rods even though there are no guides on it. Since Kevin flies in the Chicago area, he adds two extra rods to steady the model in the wind. His launching system is built out of .505-inch fiberglass tube.



RCRG's are small, and here's what happens when you lose sight of one. This is the end of KnightStar IV.

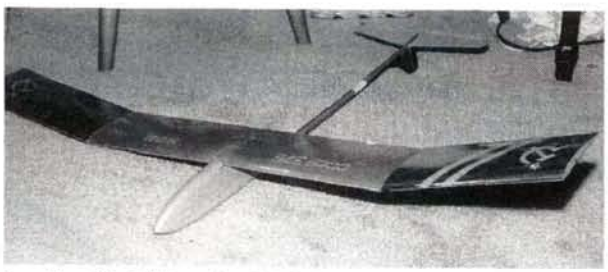
Flying with competition-quality motors can add up to quite an expense. For practice flying, D12 black power motors are useful and less expensive—only about $2 each. To get in more stick time, Kevin uses a high-start for practice. You'll notice a tow-hook in the three-view.

Because of their small size, low drag trim and low Reynolds numbers, these tiny gliders provide a real flying challenge. I haven't seen one in action, but it's not hard to imagine how a 200-square-inch model looks at 1,000 feet. The wing isn't much larger than the stab on a large, unlimited ship. If you have a hard time seeing a 2-meter ship, you probably don't want to try an RCRG.

If you're looking for something different in soaring, give an RCRG a try.

**Here are the addresses of the companies mentioned in this article:*
AeroTech, Inc., *1955 S. Palm St., Ste. #15, Las Vegas, NV 89104.*
Estes Industries, *1295 H St., Dept. 732, Penrose, CO 81240.*

■



Victor Kovalev, the former Soviet 1987 world champion, flew this folding-wing RCRG. Similar models are popular in many of the (former) Soviet-bloc countries. Wings fold for boosting, and then spring open when the rocket-motor ejection charge fires. This model has a handmade carbon-fiber boom, a built-up balsa wing and an aluminum skin. Now, that's light!

GOLDEN AGE OF R/C

HAL DeBOLT

RADIO PIONEERS

LET ME BEGIN by saying that the "ask and you shall receive" theme continues. Thank you for your responses; they fill the gaps in history and in my memory. (There is one mystery, though. When we asked for input about Kraft Systems—a major entity in early R/C—the response was nil, but when a reader inquired about the history of Frank Hoover's C.G. and F&M corporations, several of you provided material.) In retrospect, considering all the varieties of R/C that I've used, I find it strange that I've never had experience with any of Frank Hoover's offerings. (One can't do everything, says the adage.)

Frank Hoover prepares to test-glide his early '50s Blitzen.

Donald Yearout, of Pittsburg, CA, sent some pertinent information. As a youngster in Albuquerque, NM, Don became interested in modeling through FF and CL—a familiar story, perhaps, to OT'ers. Buddy Lumsford, a local hobby shop owner, arranged for Don to watch Frank Hoover's R/C flying. The bug bit Don, and he's still involved in R/C. In 1953, Frank hired Don as a production worker and model builder. (Models were needed to flight-test the R/C gear.) Don said it best: "What a fun job!"

DONALD'S BLITZEN

Remember, this was the early '50s when few R/C kits were available. Frank asked Don to build a model that would be specially suited to radio evaluation. The result was the "Blitzen"—mentioned in the February '56 *Model Airplane News*. Notice in the photo the use of a Live Wire removable R/C unit, which made changing radios simpler. Didn't the Blitzen have a pretty design for its time? It would make an excellent OT'er for someone who's looking for something different.

Stan Smith watches as Hoover starts the Blitzen's engine.

This '50s C.G. Electronics advertisement offers the advanced single-channel receiver.

THE INITIAL BUSINESSES

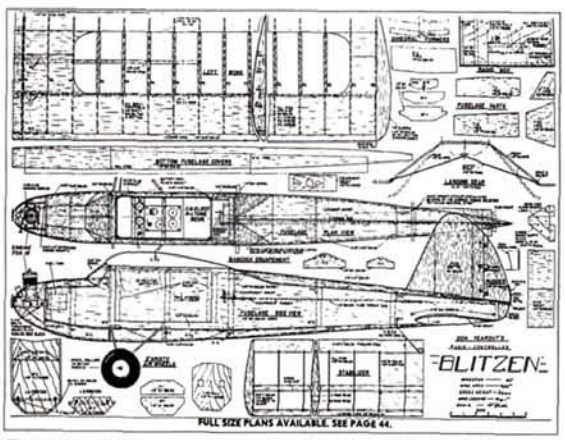
Don tells us that Frank Hoover—while still in the Air Force—was an excellent modeler whose specialty was CL scale models. He was also a ham radio operator at Kirtland Field, NM. As R/C gained popularity in the late '40s, Frank's electronic know-how led him into the field (you built your own radio then, remember?), and he experienced considerable success.

When he retired from the Air Force in 1951, Frank recognized the need for radio equipment and began a small-scale production of his system with the C.G. Electronics Corporation ("C.G." from his son's initials). Assisted only by his wife, Molly, Frank produced handmade, but reliable equipment. Since ready-built equipment was in demand, all that could be produced was sold—mostly through mail order.

Because of a need for greater production, the operation was refinanced, and it emerged as the F&M Electronics Corporation (the initials, this time, of Frank and Molly). Don stayed with the company until he moved to California in 1956.

These are Don's final words to us about Frank Hoover: "Frank was a brainy, talented man who played a significant role in early R/C, especially in the Southwest. So, Frank, wherever you are, thanks for

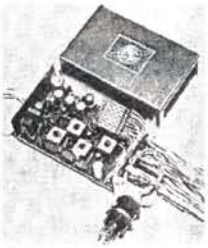
(Continued on page 108)



From the '50s, this is Yearout's attractive Blitzen radio test craft.

some great memories!" We all would have done well to make Frank's acquaintance.

The Frank Hoover story reminds me of Frank Schmidt—another excellent modeler and an electronic whiz who filled the need for reed systems. His was also a one-man operation, and he produced everything the handmade way. Schmidt deprived us of his genius when he left this world at the height of his ability.



F&M's "Midas" is a 10-channel relay-less and simultaneous reed receiver.

I also thank R.J. Simmon of Hanover, MA, for his C.G. information. Dick "dug into his pile of junk" and found some catalogue sheets. (You never know what lies in those dusty corners.)

Jim Simpson of Rio Rancho, NM, provided copies of C.G. and F&M magazine ads. Jim revealed that, after closing F&M, Frank moved on to the Electronics Consulting and Engineering Corporation.

SUPER-HET

To appreciate the type of equipment offered by C.G. and F&M, you must realize that their heyday was in the early to mid-'50s—when single channel was king. Although the company continued into the reed days, the brand disappeared.

Early radios used a "super-regenerative" receiver-signal detector and responded to a single radio frequency called a "carrier"—mostly on the 27MHz band. The super-regen principle was not stable and required constant tuning, but it was the best possible method to use with the available components. Using only a carrier frequency for control was risky because any signal on that frequency could operate the receiver. C.G. started to offer this radio style but then realized its shortcomings and developed a better mousetrap.

Don Yearout launches the Blitzen for a 1953 evaluation of C.G. equipment.

All modern radios use the "superheterodyne" receiver, which provides "selectivity" not offered by a super-regen. If a tone detector is added, the receiver will only accept a carrier signal that is modulated at the desired frequency, e.g., 300cps. This creates a safeguard. The 27MHz carrier has to be modulated at 300cps for the receiver to recognize it.

C.G. made a big advance by offering a "super-het" receiver with a tone detector for single-channel use. The first C.G. model RT-1 used four tubes and several batteries to accomplish the purpose.

Since transistors were just becoming available, Frank used them to update the RT-1 to the RT-13V—a smaller, lighter receiver that used far fewer batteries.

R/C pioneers Ed Rockwood and Frank Schmidt invented reed systems that signalled the end of single-channel popularity. F&M was slow to jump on the bandwagon, and they missed the initial surge into this area. But, when they finally did, they created the ultimate reed system—a 10-channel relay-less super-het system that used Bonner Transmite servos.

I have no record of C.G. or F&M's producing proportional systems, but a little mouse tells me that maybe they did. So, I have to ask: did they enter this phase, and if so, with what? Anyone know?

Again, this has been lengthy, so, until next time, let me say, "That's the way it was." ■

SELINSGROVE '92

With their third event—held on Labor Day Weekend—the Vintage R/C Society established their re-creation of the Selinsgrove gatherings. The grandfather of all "fun flys" was shortened to two days, but, unfortunately, the second day was rained out. Because of the poor forecast, many who had planned to participate didn't make the trip. Even so, the one-day attendance was on a par with the previous year's three-day event—hosted by the Selinsgrove Airport and Flying Service. Fortunately, Saturday's weather was fair, and the sky was full of ancient R/Cs—often five or six at a time.

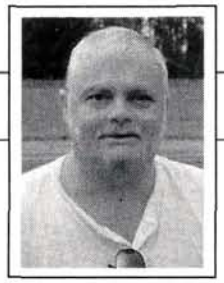
Live Wire pilots gather with their planes in a Selinsgrove hangar.

Remember, the purpose of this article is to demonstrate R/C flying in the early days. Whether you're an OT'er with fond memories or a curious newcomer, this is the place to see how it all started. Many early birds are still flown.

Several Live Wire designs were present at the '92 event—so many, in fact, that a group photo was planned for Sunday. Although the rain kept many from returning, those who made it gathered in the hangar for the photo. In the picture, you will see a variety of Live Wires: a Yankee, a Cruiser, two Trainers (one double-size model) a couple of custom bipes (one electric-powered) and some Champions.

The modelers include Bob Noll of New York, John Worth of Virginia, Tom Ailes of Indiana, Colin McKinley of North Carolina, and Mike Granieri, Gray Eudelman and Art Schroeder of New Jersey. Some VR/CS members traveled a long way to enjoy this prestigious event. Will you be there this year?

SPORTY SCALE TECHNIQUES



FRANK TIANO

JETS!

This is a typical scene at any of the larger jet flys. Spectators love the lineup, pilots love the camaraderie. Every one of these planes flew!

THIS MONTH'S COLUMN started out as an in-depth look or advisory on how to get started in scale jets. After pumping out several pages of information and forwarding it to Major Tom and the boys, I realized that much of what I wrote was not only redundant but truly quite opinionated. The Major concurred, and for a brief moment I thought of abandoning the theme for a different one. But then it hit me; why not just condense all my ranting and ravings into an outline type of article and cover as much ground in less space? So bare with me, I mean bear with me; here's how you get started in scale jet flying with a minimum of hassle.

This BVM* F-16C was built by Torey Hopkins. It is about as scale as you can get; even the retracting gear is authentic. A BVM .91 provides awesome performance.

Yellow Aircraft* produces this F-18 built by Bob Fiorenze. It is a large twin-engine aircraft with very special landing gear and brakes.

GETTING STARTED

First, go buy a jet! No, no, just kidding! First, be absolutely sure that you can manage a hot, quick-reacting sport airplane design that has a small frontal cross section for minimal drag. This will prepare you for a longer, smoother and faster glide ratio that most of the better jets enjoy. Second, be sure that your building expertise is up to par. If you're not sure, ask your best modeling buddy. If you tend to build with little regard for how well parts fit or look, jet modeling is probably not for you. If you're the type who strives for a good-looking model, and you have some degree of patience to ensure straight surfaces and clean glue joints, you're probably as ready as ever.

This is a Maverick! Scale trainer or all-out Hot Rod—pilot's choice! BVM 81 or 91 for power. Great for practicing scale paint jobs and panel lines. Tip tanks are optional.

Next, take a quick look at your bank account and check out your financial status. Jets and their associated running gear are not cheap, and most of the time the kit you decide on will require most of the additional accessories within the first few steps of building. And last, attend at least two or three of the larger Jet Flys and see firsthand what's really working out there. The more questions you ask, the more opinions you'll probably get, but eventually a pattern will develop and you'll be able to separate the bull from the real skinny. In most cases, if a particular brand of kit or series of engines is working with very little "down time," your purchasing decision will be a good one.

For your first jet model, I would advise staying away from exotic or highly complex models, regardless of how long you've been picturing yourself at the controls of one. You've not lost face to choose an entry-level model. In fact, that's what most honorable manufacturers expect you to do. Remember that while there are very few Terry Nitchs, Bob Fiorenzes, Dave Ribbes and Tom Cooks, there is plenty of opportunity to become just as good as they are. Just get out there and fly as much as you can. Jet pilots are known for logging their flights, whether they're at practice or in competition. Try doing the same.

There are several manufacturers of jet products around the USA today. While most offer some sort of scale-looking craft, few offer a true entry-level jet to get you started. Look for that entry-level craft; it's got your name all over it. Build it clean and true. Fly it in the company of someone with experience and you're all set.

JOIN THE JPO

Oh yes, there's one more very important thing to do. It is my recommendation that you join the Jet Pilots Organization, or JPO, as we call it. Their newsletter

WHAT IS THIS CONTEST TOP GUN?

Editor's note: In December, we received a letter from Roger Young that related how modeling—specifically, preparing for Top Gun—was playing a positive role in his battle with cancer. We have excerpted portions of that letter here. As this issue goes to press, Roger is in his 16th week of an 18-week chemotherapy program. His latest project is all but completed. We wish him a full recovery and hope to see him do well at Top Gun '93.

Reality is non-forgiving, non-caring and non-emotional. Reality is just hard facts that can carry as much weight as the world we live in. Reality is, "Mr. Young, you have cancer..." In this situation, you have good days and bad days, but you continue, because the reality is that you are fighting for your life...

The static judges examine Roger Young's C-47 at the '92 Top Gun Invitational.

I received my first invitation to Top Gun for the 1992 contest. I was very proud to have received such an honor. I would compete with some of the best modelers in the world. In the words of my son and daughter, it was 'awesome.' I spent several months redoing my C-47 to ensure everything was scale and properly documented. I stripped the aircraft and completely redetailed the surface. At last, it was ready. I loaded the large aircraft in the trailer and with my close friend Randy Dicks going along to be my pit crew, off we headed for West Palm Beach and Top Gun. The trip was exciting and filled with anticipation. We wondered, what was this contest Top Gun?

We arrived in late afternoon to the beautiful West Palm Beach Polo Club. The manicured grounds were highlighted with masses of colorful flowers blooming everywhere. The setting is as prestigious as the contest. It's just beautiful.

The next four days are filled with excitement. You receive a package with all the information you need first thing and follow the schedule inside. Your aircraft is static-judged at a given time, and crowds are starting to gather in the stands to watch test and practice flights. My nerves are shaky so I decide not to fly any practice flights. Some guys fly a lot, and their airplanes perform flawlessly. They make landing in the crosswind look easy.

The nerves of the day are settled by the relaxing activities of the night. A get-together every evening, and a chance to speak of the day's activities with friends old and new. The final night is the banquet, with founder Frank Tiano making special presentations, and a lighthearted roast covering events as they occurred over the past four days. Among those presentations was the Critics' Choice Award to me and my C-47. The emotion is overwhelming. It grabs you in the stomach when you hear your name. It's unbelievable, considering the company you are with.

The final day completes the flying and the winner emerges. Pride is everywhere. With the announcement of the final standings, it's time to pack and head for home. The trip back is filled with thoughts of the last four days, and the months of building leading up to the contest. Then reality creeps in and you realize what Top Gun really is. The planes are great and the flying is fun, but Top Gun is people, some of the best people in the world. People who are highly skilled, but never too good or too busy to talk about scale modeling tricks with you. People who will share anything from spare parts to complete engines if that's what it takes to help you stay in there competing. People who take the word friend and make it meaningful. People who warm your heart with friendship, or lift your spirits when things don't go according to plan.

I received an invitation to compete in the 1993 Top Gun and was thrilled at the opportunity. I had already started work on an F-15 for competition and had almost completed framing it up when it became obvious I had a problem. Two weeks in the hospital and countless tests led to the final diagnosis: lymphoma carcinoma. Chemotherapy must start right away and continue for 18 weeks. Then, after harvesting my own bone marrow, there would be a possibility of a bone-marrow transplant.

So many things go through your mind when you can no longer take life for granted. Survival is now the objective—to see my pretty young daughter and handsome son graduate from high school and then college, and to retire from work and enjoy some years of leisure with my wonderful wife of 17 years.

Just getting through 18 weeks of chemo is my next big hurdle. The need for something to focus on becomes real. As the days pass after a treatment, I realize the wonderful experience of Top Gun has become a daily motivator to accomplish something on the aircraft, instead of thinking only of the sickness and treatment. My thoughts are on living and competing once again at Top Gun.

Top Gun exists only because a small group of caring, dedicated people. Without the financial support of Zap and *Model Airplane News*, Top Gun would probably not exist in its current format. These people are doing far more than they are even aware. Sure, they are trying to market products, but they have other ways of accomplishing the same thing for a lot less expense. They deserve our support by the use of their products. Bob Violett, as well as others, has been a major contributor to the Top Gun contest.

Then you come to the creator of Top Gun, Mr. Frank Tiano. Top Gun is Frank's brainchild. He has worked countless hours, taken criticism as well as praise, and fought hard to make Top Gun the highly prestigious contest it has become. A contest of this caliber requires countless hours of planning, meetings, and requests for support from manufacturers. The facility preparations alone are monumental. However, Frank continues to meet the challenge. He makes it all happen. Frank truly is Mr. Top Gun.

I would like to express my most sincere appreciation to Frank as well as all Top Gun supporters. You are providing far more than just another contest. It is an inspiration to new and old modelers alike to achieve excellence in modeling and be included in this event.

On good days, I will do what I can on the aircraft and get that much closer to Top Gun. Thanks to Frank and Top Gun and my family, I will beat this illness. When Top Gun 1993 is over, and I am packing to go home, my final standing won't seem so important. I will have won.

—Roger Young

Mark Frankel shows off his F4D Skyray. The plane was published as a construction article in the April MAN.

will keep you well-informed about all sorts of stuff, like where the next jet events are being held, what's new in the marketplace and what the results of past jet events were. Dues are a mere $30 per year, and you can get your very own membership number by writing to Ralph Bailey, at 5088 Bragg Blvd. NW, Orangeburg, SC 29115. And allow me to be the first to welcome you to a whole new world of exciting people, performance and pleasure!

SCALE DOCUMENTATION SOURCES

The other question I must address this month is one that asks where in the world scale modelers find all that stuff they call "documentation?" Well, first let's define the word "documentation." To me, it's anything and everything in print that I can collect on a specific aircraft that I may refer to while building or finishing a model of same.

The BVM T-33 is shown in flight.

I've often recommended to friends that they pick up a simple, inexpensive file-folder holder—the kind that accepts hanging files—to keep information on any aircraft that interests them, even if the information will be used at a much later time. So, for example, we have a folder with ME-109 written on it, and we file it alphabetically in the file holder. If we have a magazine we are ready to discard that has an article on the Messerschmidt 109 in it, we cut that article out, file it away and toss the rest.

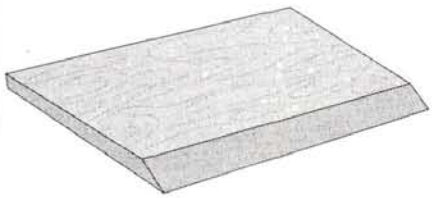
So anything we may have collected may be called documentation. The little booklet that we assemble this information in for our scale judges now becomes our "presentation." And where do we get all this material for our presentation or documentation? Well, the easiest place to find any information on any aircraft is from companies that specialize in providing such stuff. For example, there are two very large book companies that specialize in aviation literature through mail order. There are at least three companies that deal in line drawings of various aircraft (commonly called 3-views), and at least three that can provide color photo packs of specific aircraft.

Sometimes, a trip to your local hobby shop can produce at least a Squadron Signal book on your newest project. Color chips can be found right from Uncle Sammy (we've told you about this before), and from several other sources. Air shows sometimes have a flea market

This is the ETA kit of the F-18, for single engines and a Dynamax fan. All designs fly well, an A-7 Corsair is almost ready. Great sport flier.

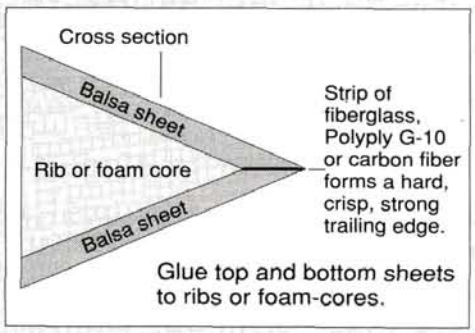
CONTROL SURFACE TRAILING EDGES

One of our most recent letters asks how we are able to get a sharp looking, straight and strong trailing edge on our control surfaces. Most of us want something other than the square, thick and blunt looking edges we sometimes find on a typical sport ship. The answer is an easy one. Check out the diagram and follow along. Let's say we're sheeting an aileron, for example. First, we lightly *block*-sand away part of the balsa skin to form a beveled edge along its entire length. Do this for both the top and bottom skins.



Bevel edge of balsa sheets with a small sanding block, then Zap a strip of hard material to the beveled edge.

When placed together with the beveled surfaces touching, the skins should form a very thin, although weak, trailing edge. Now the neat part. Take some .015 fiberglass sheet, G-10 or carbon fiber strips (even 1/32 aircraft plywood can be substituted), about 1/2 inch wide, and Zap the strip to the *inside* edge of the top or bottom sheet. Go ahead and place this sheet on your built-up surface or foam panel. Repeat with the second piece, and you've got a balsa sheet trailing edge encapsulated with a hard core of glass or carbon that will retain its shape and resist dinging forever. And, as a bonus, the trailing edge appears to have a scale thickness.



Glue top and bottom sheets to ribs or foam-cores.

SCALE SOURCES

Nostalgic Aviation photo

Nostalgic Aviation
710 Glendale Ave.
Palm Bay, FL 32907
407-727-8445
Photos of aircraft and pilots. Custom research of any airplane/pilot. B&W and color available
Catalogue $1

Scale Model Research
att: Bob Banka
2334 Ticonderoga Way
Costa Mesa, CA 92626
714-979-8058
Photo packs and line drawings
Catalogue $5

Scale Plans and Photo Service
att: Dr. or Mrs. Pepino
3209 Madison Ave.
Greensboro, NC 27403
919-292-5239
Photo packs, working plans
Catalogue $5

Bob Holman Plans
P.O. Box 741
San Bernardino, CA 92402
714-885-3959
Working plans and line drawings
Catalogue $6

Zenith Aviation
P.O. Box 1 MN093
Osceola, WI 54020
800-826-6600
Large book catalogue free

Historic Aviation
3850 M Coronation Rd.
Eagan, MN 55122
800-225-5575
Large book catalogue free

Aviation USK
att: Tom Frisque
602 Front St.
Usk, WA 99180
509-445-1236
Books and unique plastic kits
Catalogue free

attached, with all sorts of aviation memorabilia, and you never know what literary treasures you might find. In fact, at a small airshow in Kissimee, FL, a couple of weeks ago, I stumbled across a company that specializes in photographs of WW II aviators, aces and their aircraft. What a find! Now, I realize that somebody like Charlie Nelson couldn't care less about a company like this, simply because serious research has yet to produce any American or foreign pilot who became an ace while flying a Waco.

Anyway, Nostalgic Aviation of Palm Bay, FL, has pictures and pictures of famous and not-so-famous airmen from the Marines, Navy, Army Airforce and even the Flying Tigers. Most feature the pilot and his airplane, which is an invaluable addition to anyone's documentation. And, many are signed photos! But getting back to what I was saying, companies like Nostalgic Aviation are all over the place; you simply must seek them out! Next time you're traveling to a big city, grab a copy of the "Yellow Pages" and look under the heading "book stores." You might be surprised to find one or more stores specializing in military books—some of them aviation. And some of these stores have out-of-print stuff just lying around.

I have my favorite resources, which I'll be happy to share with you. One of the most important organizations is the National Association of Scale Aeromodelers, or NASA for short. You may remember that I mentioned NASA about a year ago, and suggested that for our small fraternity, it may be the one organization that can really help when it comes time to gather information for a new project. Each issue is chock full of lessons, sources, book releases and swap shop stuff. For $8, you can join. Just send your check to Bert Dugan, 11090 Phyllis Dr., Clio, MI 48420. What the JPO does for the jet guys, NASA does for the scale enthusiast. There are several other sources that I've come across over the years, but many have dropped from sight. There may be hundreds of other outlets out there that I don't know of. Check out "the list," and if you know of others we should know about, drop me a line with their name and address, and I'll be more than happy to share it.

Next time, we'll deal with some scale finishing questions and possibly two "how to" applications. Until then, keep in mind that a wireless ignition must still be "wired" to your engine in order for it to work. Your six is cleared!

**Here are the addresses of the companies mentioned in this article:*
***BVM,** 1373 Citrus Rd., Winter Springs, FL 32708.*
***Yellow Aircraft,** 203 Massachusetts Ave., Lexington, MA 02173,*
***ETA,** 4930 47th St., Lubbock, TX 79414.* ■

CLUB OF THE MONTH

MT. RAINIER R/C SOCIETY
P.O. BOX 73939, PUYALLUP, WA 98373

A recent issue of the Mt. Rainier Radio Control Society's (MRR/CS) "Pfeiffer Field R/C News," is a prime example of what a newsletter should be—informative! The "Prez Says" column offers the most important information: president Mark Reynolds urges all of his Puyallup, WA, club members to write to the FCC and to their senators and congressmen in Washington, D.C., to express their opposition to the Proposed FCC Land Mobile Service's Notice of Proposed Rule-Making (NPRM), PR Docket 92-235. If it's passed, this proposal will allow even more commercial channels to be crammed between our existing R/C channels; this will render useless over half of the R/C radio frequencies. It's a very important issue, to say the least!

The newsletter also provides helpful building and troubleshooting tips for the novice builder and flier. Reinforcing firewalls and fuel-proofing a model's engine and fuel-tank compartment might be old hat to seasoned modelers, but newcomers welcome hints on such procedures.

The MRR/CS is famous for sponsoring Puyallup's annual Northwest Model Exposition trade show. We commend Expo chairman Bob Ford (club treasurer), ex-president Dave Baxter and all MRR/CS club members on the Expo's success. Dave Baxter explains that the show is the club's way of promoting their favorite hobby; they really enjoy bringing hobbyists and manufacturers together. So, to our newest club of the month: enjoy your two complimentary subscriptions! ■

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the ***Model Airplane News*** **Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address and telephone number.

HOBBY SHOP DIRECTORY SPACE RATE
- **$179 per year**
- **$97 for six months**
- **$48.50 for three months**

—ALL PAYABLE IN ADVANCE
Space reservations must be received by the 10th of the third month preceding publication (for example, January 10th for the April issue).

NEW YORK—Brooklyn
R/C planes, helicopters, boats, cars, rockets and jets. Full line of parts and accessories. *Huge inventory! If we don't sell it, they don't make it!* Bob Violett dealers. Huge heli stock: Hirobo, TSK, X-Cell & Concept (all models). Discount prices every day! Mon./Thu./Fri., 10-9; Tue./Wed. 10-7; Sat./Sun. 10-6.

THE ULTIMATE HOBBY
7021 Veterans Ave., (718) 241-8434
(Off Ave. "U" and E. 70th) [6/93]

LATIN AMERICA
BRASIL—Belo Horizonte
Aeromodelos, carros, barcos ehelicopteros radio controle. Modelos plasticos para montar, partes e concertos.

HOBBY 'N WOOD MODELISMO LTDA.
Av. Silviano Brandao 2100
Tel: 55-031-463-9944 Fax: 55-031-4615501
[7/93]

NEW JERSEY—New Brunswick
R/C helicopters: Concept, Schluter, parts & accessories. R/C cars, boats, parts & accessories. Customer support available. "A daddy's toy store."

HOVER CENTER PLUS, INC.
131 French St. (908) 937-5828
[8/93]

OHIO—Findlay
Findlay's local R/C dealer; planes, cars, boats. We specialize in R/C. Large selection of kits, accessories and parts. We're authorized Sig and Dremel dealers. We also sell model rockets. Tue./Thu. 1-9; Mon./Wed./Fri. 10-9; Sat. 10-5.

JINX MODEL SUPPLIES
721 Rockwell Ave. (419) 422-5589
[7/63]

VANCOUVER—CANADA
We specialize in R/C jets, both electric and gas planes. Dealer for Violet, Byron and Yellow Aircraft. Mail orders welcome.

SILVERWING HOBBIES
118-2838 E. Hastings St.
Tel: (604) 255-2838 Fax: (604) 255-7088
[4/94]

FLORIDA—Winter Springs
UPS orders shipped daily. Dealer for Yellow Aircraft. Send $3 for Yellow info pack. Full line of hobby accessories. Visit our showroom—35 mins. from Disney World.

BOB FIORENZE HOBBY CENTER, INC.
420 W. S.R. 434 (407) 327-6353
[10/93]

NEW YORK-Penfield
Full-service hobby shop; 27 years of R/C experience! Airplanes, boats, rockets, pine cars, plastic and wooden models, tools, accessories. Daily UPS shipping worldwide—special orders encouraged! Dealer for Ace, Hitec, JR—sales and service.

PANCO HOBBIES
1865 Penfield Rd. (Rte. 441) (716)383-1320

WEST PALM BEACH—Florida
Everything you can imagine for any segment of the hobby. "Discount prices plus *good advice*, I promise"—Frank Tiano.

HOBBY SUPER STORE
1387 N. Military Trail (407) 688-0669
[5/94]

NEW JERSEY-River Edge
Everything for R/C, U/C and F-F modeling R/C cars, boats, planes, helis and tanks; rocketry. Engines, radios, supplies, books and videos. Modeling tools equipment and accessories —and much more at discount prices. Huge inventory. Visa/MasterCard/Discover.

AMERICA'S HOBBY CENTER
820 Kinderkamack Rd. (201) 265-2044

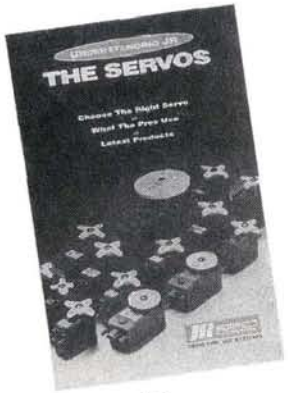
NEW YORK-New York
Everything for R/C, U/C and F-F modeling. R/C cars, boats, planes, helis and tanks; rocketry. Engines, radios, supplies, books and videos. Modeling tools equipment and accessories —and much more at discount prices. Huge inventory. Visa/MasterCard/Discover.

AMERICA'S HOBBY CENTER
146 W. 22nd St.
(between 6th & 7th Ave.) (212) 675-8922

Send sales message and payment to
Model Airplane News,
Hobby Shop Directory,
251 Danbury Rd., Wilton, CT 06897.

For more information, call toll-free (800) 243-6685 and ask for Arlene Melko.

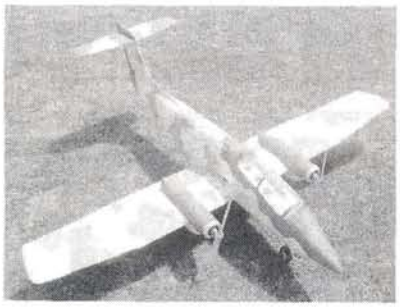
PRODUCT NEWS



JR
"The Servos"

This *free*, 28-page servo guide is an in-depth study of the entire JR servo line that includes information on selecting the right servo and on conventional versus coreless servo motors. Packed with photographs, charts and graphs, the easy-to-read text reviews 15 servos. There's also a pull-out, double-page servo-selection guide with complete information on specifications, applications and prices for every JR servo.

Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-0022.

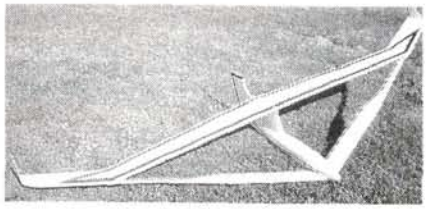


KRESS JETS
Pucara

The Pucara is a large, good-looking twin that's powered by two Astro 05s. The model is fully aerobatic and, with seven cells per engine, flights are quite long. The foam-core wings are sheeted with balsa, and grass takeoffs are easy. Specifications: wingspan–62.5 inches; takeoff weight–6 pounds.

Prices: $155 (full kit); $78.50 (semi-kit with less wood); $18 (plans—price can later be credited toward a kit).

Kress Jets, Inc., 4308 Ulster Landing Rd., Saugerties, NY 12477; (914) 336-8149; fax (914) 336-5975.



GEM MODELS
Rising Star

The Rising Star—a uniquely shaped, inherently fast thermal glider—features an excellent glide ratio and minimal sink rate. The vortex drag has been virtually eliminated. The kit includes foam-core wings, pre-cut fiberglass structural panels and all the balsa and hardware needed to complete it. Specifications: wingspan—98 inches; lifting area—650 square inches; weight—30 to 34 ounces.

Price: $149 (plus $5 S&H).

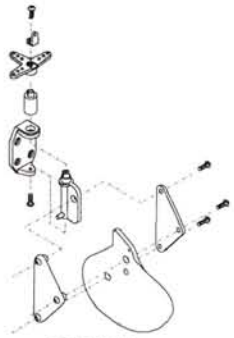
Gem Models, 801 Las Vegas Blvd. S., Las Vegas, NV 89101.

LANIER R/C
Stinger .10

Lanier R/C's new baby Stinger—the Stinger .10—is approximately 40 percent of the original Stinger's size. It is designed expressly for the O.S. .10 engine, but those looking for even more performance could mount an ASP .12 or an O.S. .15. Its construction is the same as its big brother's, and it's quick and easy to build. Features include a square fuselage that's embellished with ABS plastic parts on top and a built-up tail assembly that ensures lightness. The kit includes a T6 landing gear, a cowling, wheel pants and a canopy.

Price: $59.95

Lanier R/C, P.O. Box 458, Oakwood, GA 30566; (404) 532-6401; fax (404) 532-2163.



ERNST
Water Rudders

This high-quality, glass-filled, nylon airplane water rudder combines scale-like appearance with precision molding. Stainless-steel screws prevent rust, and the precision-molded parts ensure an accurate fit. The rudder's automatic "kick-up" action allows safe beaching, and the custom-molded steering arm allows push-pull or pull-pull connection with either one or two water rudders. Each unit fits a wide range of float sizes and installation schemes.

Part nos. 155 (for .40 to .60 size); 156 (for ¼ size).

Prices: $6.98; $7.98.

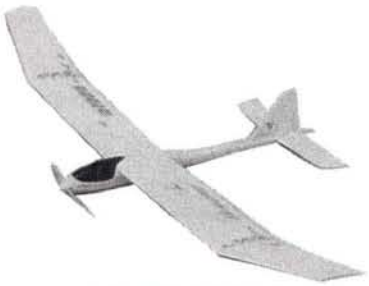
Ernst Mfg. Inc., Mt. Hood Industrial Park, 37570 Ruben Ln., Ste. B, Sandy, OR 97055; (503) 668-5597.

UNIQUE AIRCRAFT
MiG-29A

Unique Aircraft introduces this ⅛-scale MiG-29A ducted-fan kit. It features a pre-joined, one-piece, epoxy fuselage with panel lines and details; all fiberglass intakes, exhaust ducts and engine shrouds; separate molded hatches and louvers; foam-core wings, stabs and fins; a vacuum-formed canopy, a cockpit interior and drop tank; and much more. It's also available as a basic kit, ARF or ready-to-fly. Specifications: length—96 inches; wingspan—74 inches; weight—23 to 25 pounds; number of channels—5 to 8.

Unique Aircraft, 105 W. Remington St., Irvine, CA 92720; (714) 786-8469.

PRODUCT NEWS

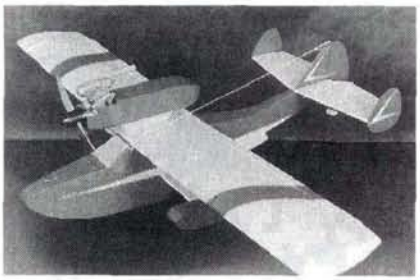


HOBBY LOBBY
Biene

The Biene ("bee" in German, so everything is yellow) is the easiest Graupner electric sailplane to fly, and it's ready-built. The two-piece wing is a hand-built, balsa, rib-and-spar structure, and it's hand-covered. The polyhedral wing makes the Biene both stable and maneuverable. Specifications: wingspan—63 inches; length—32 inches; wing area—372 square inches; flying weight—40 ounces; wing loading—15 ounces per square foot.

Price: $199.

Hobby Lobby International, Inc., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444.



HANGAR DESIGNS
Sea Cruiser

The Sea Cruiser is an easy-to-fly, all-wood seaplane that has a solid, slow-speed handling. It features machine-cut balsa/plywood parts and hardware package, and it's easy to build. Specifications: wingspan—49 inches; semisymmetrical airfoil—384 square inches; length—37 inches; weight—52 to 60 ounces.

Price: $69.95 (plus $5 S&H).

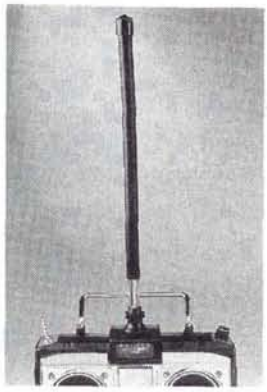
Hangar Designs, 2 Raccoon Ct., Jacksonville, AR 72076; (501) 834-8177.

BOCA BEARING
"Engine Bearing Guide"

Boca Bearing has just released its newest "Engine Bearing Guide" for airplanes and helicopters. The guide has a complete listing of all the phenolic and reinforced-plastic or polymite retainers for ASP, Enya, K&B, O.S., Saito, Super Tigre, YS and others—and in all the most popular sizes.

Price: $3 (or charge to your VISA/MC for $4.95).

Boca Bearing, 7040 W. Palmetto Park Rd., Ste. 2304, Boca Raton, FL 33433; (800) 332-3256.



HITEC
Rubber Duck Antenna

This new flexible antenna is designed to work with most name-brand 72MHz transmitters (except for JR Systems). Because of its unique design, you can use it without concern about range loss. And, you can never forget to pull up your antenna.

Part no. RCD1125

Price: $19.95

Hitec R/C USA, Inc., 9419 Abraham Way, Santee, CA 92071-2854; (619) 449-1112.

DCU
Pilot Figures

This high-tech, thermal-set, plastic 1/10-scale jet pilot is modeled after real Marine pilots in full flight gear. Lightweight and hollow, it's easily painted with enamel paints over the white base. Full-bodied and bust figures are available; other scale sizes will be available in the future.

Price: $19.95 (full-bodied); $9.95 (bust).

DCU, 1564 S. Anaheim Blvd., Unit B, Anaheim, CA 92805; (714) 535-6969; fax (714) 778-6969.

RJL INDUSTRIES USA
VT 49 Engine

This VT 49 4-stroke engine features overhead rotary valves for smooth, quiet, trouble-free operation. The ABC valving is supported by either a bushing or roller bearings, and it never requires adjustment. With no valve-float or valve-spring tension to overcome, you'll get more power and rpm.

RJL Industries USA, P.O. Box 5, Sierra Madre, CA 91025; (818) 359-0016.

Descriptions of products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to 11-year-old Andy Dryden of Seattle, WA, for correctly identifying the March '93 mystery plane. Andy's was the first of 32 correct answers that we received.

The Lark Commander, also known as the Aero Commander Lark 100, was produced in 1965 by Volaire Inc. When Aero Commander (a division of North American Rockwell) acquired this small company, only three Model 100As had been built. In an attempt to compete with the Cessna 172 Skylane, Aero Commander developed the Model 100, which was later named the Darter Commander. Production continued until 1969, by which time about 200 aircraft had been built. In 1967, an upgraded version was introduced—the 100-180 Lark Commander, which was powered by a 0-360-A2F, 180hp Lycoming engine and included a new sweptback tail design. This version was not profitable (by 1971, only about 200 had been sold), and Rockwell sold the design to Phoenix Aircraft Co.

The Lark Commander had a wingspan of 35 feet, and it was 22 feet, 6 inches long. With a gross weight of 2,475 pounds, its top speed was 138mph, and it had a range of 560 miles. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

CLASSIFIEDS

RATES: non-commercial—25 cents per word. No charge for name and address(no commercial ads of any kind accepted at this rate.); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.**

To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month,3 months in advance e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. **SEND AD AND PAYMENT TO: CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.**

R/C WORLD—ORLANDO, FL, CONDO RENTAL—2 bedroom, furnished. Available weekly or monthly. Low rates, 100-acre *flying field with enclosed hangar. Swimming pool, tennis* courts on site. Minutes from Disney World and Epcot Center. For information, call Micki at (800) 330-7243 or (407) 260-1252; fax (407) 331-3867; or write to: Page One Management Realty Inc., P.O. Box 4732, Winter Park, FL 32793-4732.

VACUUM FORMING—Now in its third printing, the most comprehensive book on vacu-forming ever published for the hobbyist. 128 pages of hands-on information show how easy it really is to make your own plastic parts. Includes exclusive *information on an easy-to-build 2-stage vacuum system for* truly professional results. It's easy! Try It! $9.95 + $1.05 postage. Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360; (800) 737-3000. $1 surcharge for Visa/MC. [7/93]

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [6/94]

WANTED: your old proportional radios; interested in pre-1980, American made; C&S, Deans, Klinetronics Spar and others. Older is better. Ron Gwara, 21 Circle Dr., Waverly, NY 14892; (607) 565-7486. [9/93]

WANTED: Old, unbuilt, plastic model kits. Planes, military, *figures, cars, promo. Aircraft or missile desk models. Send* list, price. Models, Box 863, Wyandotte, MI 48192. [9/93]

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pages—timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid, U.S.; $20 foreign. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078 [8/93]

MAGAZINE BACK ISSUES—Flying Aces, MAN, Air Trails, 1930s and '40s. FM, RCM and more. Send SASE for list to: Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [8/93]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [10/93]

WANTED: model airplane engines and model race cars made *before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand* Springs, OK 74063; (918) 245-3649. [6/93]

WANTED: Built or partially built Ercoupes, Mooney M-10 Cadets, or Cessna 150, 152, 172, 182. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585. [10/93]

WANTED: Original kit form, circa 1968-1970, "Schoolmaster" by Top Flight. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [6/93]

WANTED: *Original kit form, circa 1960-1963, Eindecker* model, free flight or R/C. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [6/93]

WANTED: model rocket catalogues, magazines, certain rocket kits and engines (1958 to 1975) from Estes, Centuri, Model Missiles, Vashon, Coaster. Art Nestor, 230 Arthur St., Zelienople, PA 16063. [6/93]

THREE THOUSAND-plus old-time plans, rubber gliders, three-*views, CL, R/C, boats. Largest illustrated catalogue avail*able—$4. Refundable. Allen Hunt, P.O. Box 726 C, Dunbar, WV 25064-0726. [5/93]

CAD-DESIGNED, Space Shuttle mailbox prints—$14.86; ceramic jumbo-jet birdhouse—$24.95. Hangar 18 Reproductions (Dept. ma), P.O. Box 153, Chelsea, OK 74016. [8/93]

PLANS ENLARGED—Scanning/plotting services; CAD/printer plotter software. Free information. Concept, P.O. 669E, Poway, CA 92074-0669; (619) 486-2464.

125 Plus kits for sale. Balsa plastic tools, list $1. Denhoff, 787 Pawnee, Carol Stream, IL 60188. [9/93]

FROSTING ON THE CAKE! The best "stick-on" graphics any where! Spice up your next ho-hum covering job with these *eye-catchers! Free catalogue. Silicon Valley R/C Technologies:* (800) 822-1500. [6/93]

NONE BETTER in the universe! The best VHS flight-instruction tapes available anywhere! Silicon Valley R/C Technologies: (800) 822-1500. [9/93]

ARF KITS—Ryan-style design; 52" and 72" wingspan. For information, write to Design Consultants, P.O. Box 2189, *Culver City, CA 90231.* [7/93]

GEE BEE plans used for Benjamin's R-2 (1/4 scale, etc.). Plans catalogue/news—$3.25 (refundable). Vern Clements, 308 Palo Alto, Caldwell, ID 83605. [6/93]

SCALE AIRCRAFT DOCUMENTATION and RESOURCE GUIDE. World's largest commercial collection. Over 4,000 different color Foto-Paaks and more than 22,000 three-views. Catalogue—$5 ($10 foreign). Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [8/93]

WANTED—World War II and postwar recognition models. Old toy airplanes, cars, trucks, Zepplin, etc. Bill Fornwalt, 103 Dartmouth Ave., Johnstown, PA 15905. [11/93]

INTERNATIONAL AIRCRAFT RESEARCH. Need documentation? Include name of aircraft for availability of documentation with $3 for three-view and photo catalogue. 1447 Helm Ct., Mississauga, Ontario, Canada L5J 3G3. [6/93]

QUIET YOUR ENGINE with Koosh-In-It—a flexible, rubber-fabric laminate that "softens" engine vibration. Install it between the engine, engine mount and/or firewall. Pad measures 2 1/2x4 inches and is 1/16 inch thick, and it can be cut easily with blade or scissors. Only $5.80, postage-paid. Balsadust, P.O. Box 078, New York, NY 10021-0078; (212) 737-0071. [7/93]

BUDGET FLIGHT BOX. Compact, 1,620-cubic-inch volume *holds: gallon of fuel, starter battery, starter, tools, spare* props, parts, transmitter, first aid, etc. Handle folds and box serves as low-profile table stand for models 1/2A through 84 inches. Sig SR plans, only $4 PPD; kit—$12, plus $5.50 S&H. A. Chen, P.O. Box 4213, Irvine, CA 92715. [7/93]

SCALE DOCUMENTATION: PLAN ENLARGING. 140 superscale, sport and giant R/C construction plans, three-views, cut-away drawings. Over 100,000 documentation photos in stock; 120-page catalogue—$5 ($10 overseas airmail); Visa/MasterCard. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239. [4/94]

IMPORTED DIESEL ENGINES. World's best selection: AE, AM, Aurora, Cipolla, KMD, MAP3, Mikro, MK-17, MVVS, Modela, PAW, Pfeffer, Letmo and USE diesels, plus very special imported glow engines, CO_2 motors and sailplane kits. Ten-page catalogue—$1. Carlson Engine Imports, 814 E. Marconi, Phoenix, AZ 85022-3112. [6/93]

P/C—THE EASY WAY *to simulate metal panels; $1 gets information and sample.* Clarke Smiley, 23 Riverbend Rd., Newmarket, NH 03857. [6/93]

1930s to 1950s MODEL AIRPLANE MAGAZINES—1930s aviation pulps—complete and in good condition; $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada, M5M 1W. [6/93]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $2 for large list to Rob *Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-*5537. [5/93]

LOCKHEED P-38 LIGHTNING—Are you a P-38 Lightning fan?—R/C models or full-size? Join the P-38 Model Organization International! For more information, send $1 to the P-38 Model Organization International, Medelbyvej 54, 2610 Rodovre, Copenhagen, Denmark. [8/93]

ENGINE WRENCHES—precision wrenches for threaded case covers and cylinders. Supercyke, Spitfire, Brown, Bunch. Bob McCord, 325-93 Sylvan Ave., Mountainview, CA 94041. [5/93]

WANTED—KRAFT KP-4/6 from 1964-66. Karlheinz Schmid, Stieranger 7, 8900 Augsburg 21, Germany. [12/93]

MAKE REAL DECALS with your computer and printer! Send $10 for starter kit and instructions to LABCO, 27563 Dover, Warren, MI 48093-4764. [10/93]

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O.S. FT-120 GEMINI II flat twin 4-stroke engine N.I.B. $575 plus shipping: (206) 742-7653. [6/93]

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